Sustaining Investment In The Northern British Columbia Forest Industry: Rates Of Return And Cost Of Capital

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ABSTRACT

Forest resources and the forest industry have played a key role over the last 90 to 100 years in providing a livelihood to the people settling in northern British Columbia. Pulp mills were attracted to the region because of the availability of residual woodchips from area sawmills. The two segments now share the cost of timber harvesting through the sale of residual chips from sawmills to pulp mills. In order to be financially sustainable the industry must generate returns that compensate the providers of financial capital. To test whether this is occurring in the Northern British Columbia forest region two firms were selected for study as a proxy for the industry. During the five-year period 2000 – 2004 the lumber assets of one firm earned a return slightly lower than its cost of capital while the lumber assets of the second firm generated returns exceeding its cost of capital. Panel returns exceeded required returns. Pulp earnings however, were significantly below required returns for both firms.

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INTRODUCTION

Northern British Columbia is rich in natural resources and the use of these resources has been the basis of development in the region. Forest resources and the forest industry have played a key role over the last 90 to 100 years in providing a livelihood to the people settling in the north. Over the years the industry has been buffeted by economic cycles that at times have encouraged the industry to expand and at other times forced it to contract.

The forest industry, like any other, makes operating and investment decisions based on the financial returns generated by their capital investments. During the last several decades the primary products manufactured in northern B.C., lumber and wood pulp, have been sold globally. The United States has been the primary market for lumber, while wood pulp has been shipped to the U.S., Europe and Asia. Over the last 10 years the financial return on capital invested in the forest industry in Canada has been declining. This is cause for concern because if the industry cannot generate the returns required to attract investment to maintain or augment existing capital, the industry will become less competitive compared to other regions of the world producing forest products where investments have been made. Producers from other countries will meet the needs of global consumers. This would have a significant impact on Northern British Columbia.

The prices of commodities on world markets, trade barriers, and new manufacturing capacity affect all regions of Canada. Northern British Columbia has a unique challenge with the Mountain Pine Beetle, an insect that is killing pine trees in the central interior. The large volume and quality of timber available in the next decade and

then a reduction in available timber for decades after will have an impact on the northern forest industry.

This paper will look at the question of whether the forest industry in northern British Columbia is earning the financial returns required to attract the investment necessary to sustain the industry. The two largest firms operating in the Northern Interior are used as a proxy for the industry. The two largest product segments are pulp and lumber and there is a growing panels component. The weighted average cost of capital will be calculated and compared to actual results from the two firms to determine if satisfactory returns were achieved. Further, a review of finance literature suggests that the firm's cost of capital may not be the appropriate screening rate to evaluate investment proposals in multi-division firms where the divisions have substantially different degrees of risk. To the extent that divisions in a corporation have degrees of risk and financial characteristics that are different from the parent corporation, using the overall hurdle rate is certain to lead to incorrect decisions. The cost of capital by market segment for the two proxy firms is calculated and compared to actual performance in an effort to understand the relative performance of the three market segments.

The results show that lumber is close to earning the required return, the panels segment returns have exceeded its cost of capital, and the pulp segment has not earned the required returns for the time period under study.

HISTORY OF FORESTRY IN NORTHERN B.C.

The first harvesting of timber in Northern British Columbia started in 1907 to help build the Grand Trunk Pacific Railroad. The rail route was intended to follow the Upper Fraser River to Fort George, then cross the river and continue west just south of the Nechako River. Wood was needed to supply poles for telegraph lines, ties for the road bed and timbers for tunnels. On September 10, 1910 an advertisement for a new town site east of Fort George ran in the South Fort Herald newspaper. Among the attractions to the new town were "vast timber interests – Saw and Planing Mills and possibly a pulp mill being planned". By 1919 there were eighteen sawmills in the 146 miles between Prince George and McBride, and further interest in a pulp mill from established companies and entrepreneurs. In fact, the first pulp mill did not arrive until the early 1960s.

The forces for finally establishing a pulp industry in the northern interior started from a meeting that Tom Wright, Dean of Forestry at the University of British Columbia, had with Ray Williston, Minister of Lands and Forests (Bernsohn 1981).[1] Wright discussed his findings from a recently completed study that showed only twenty-five percent of the wood on a given acre reached the final product. The remainder was left in the forest, broken, ignored or burned as debris – in a word, wasted. Williston later said "That meeting made the most powerful impression on me of anything that happened while I was Minister" (Bernsohn 1981).

[1] No specified date for the meeting was given, but based on Wright's term as Dean of Forestry we know this was circa 1963.

Williston captured more of the wasted wood, much of which was to be made available to pulpmills, by offering a "carrot' to the industry. Any mill that cut 25,000 board foot[2] measure per shift and

- installed a barker and a chipper (to make the wood available to pulp mills in a form they could use)
- agreed to cut and process wood down to a four inch top in the interior
- agreed to use all trees over seven inches wide at breast height or larger in the interior
- cut the stump within a foot of the ground

was given access to one-third more wood than had been originally bid on. These standards were a lot tougher than the earlier ones which allowed stumps to be eighteen inches high, permitted tops left behind to be anything under eight inches, and allowed trees under eleven inches wide at breast height, to be ignored. Since the smaller logs had previously been considered only good for pulp mills, the government charged pulp stumpage of $.55 for twelve years.

Because sawmills could suddenly get more wood without bidding at auctions, and could pay very low prices for it, they began to harvest the wood. Lumber companies started finding ways to use this "smallwood" economically to produce high-value lumber products. With an assured supply of chips, Williston's job of convincing companies to construct pulp mills was made easier.

In order to give additional fibre supply assurance to companies willing to invest in pulp mills the Pulpwood Harvesting Agreement (PHA) was developed in 1961 (Bernsohn

[2] Board foot is a measure equivalent to one square foot of lumber one inch thick.

1981). The Agreement guaranteed the right to use wood not normally used by sawmills. Because sawmills did not want other firms operating in their timber areas, a rule was established prohibiting pulp companies with PHAs from competing with sawmills at timber sales, and forcing the pulp firms to purchase chips wherever "economically feasible".

The first pulp mill to be built in northern British Columbia was Prince George Pulp, a joint venture between Canadian Forest Products Ltd. and Reed Paper. The firms agreed to use as much sawmill waste as was economically possible, and like most other interior pulp mills it received an understanding from the government that the mill would have the exclusive right to purchase chips from sawmills in the area covered by the pulpwood harvesting agreement. This understanding was not in the PHA. Instead, agreements covering lumber producers that installed chipping equipment to qualify for extra timber often included a clause stipulating who would get the chips produced.

Construction of the mill started in 1964 and was completed by April 1966. Northwood Mills was awarded a PHA in 1964, Intercontinental Pulp and Caribou Pulp and Paper were awarded in 1965.

The arrival of the pulpmills changed the size and shape of the forest industry in the north. Chip prices helped keep lumber mills in business when the price of lumber dropped. Today a pulp mill in northern B.C. typically uses 65 railcars of chips per day. Ray Williston commented, "My goal was the approval of enough pulp capacity to require the very poor sawlogs to be chipped" (Bernsohn 1981).

In 1973 the lumber industry experienced a recession and lumber prices declined forcing shutdowns and layoffs. On October 8, 1973 a group called the Independent Chip

Producers was formed, made up of thirty northern sawmills, which claimed they were being cheated on the price of chips (Bernsohn 1981). On January 17, 1975 the *Timber Products Stabilization Act* became law, legislating minimum chip prices. Although legislated chip prices have long since been abandoned the price paid for chips closely links sawmills and pulpmills in the north.

IMPORTANCE TO NORTHERN ECONOMY

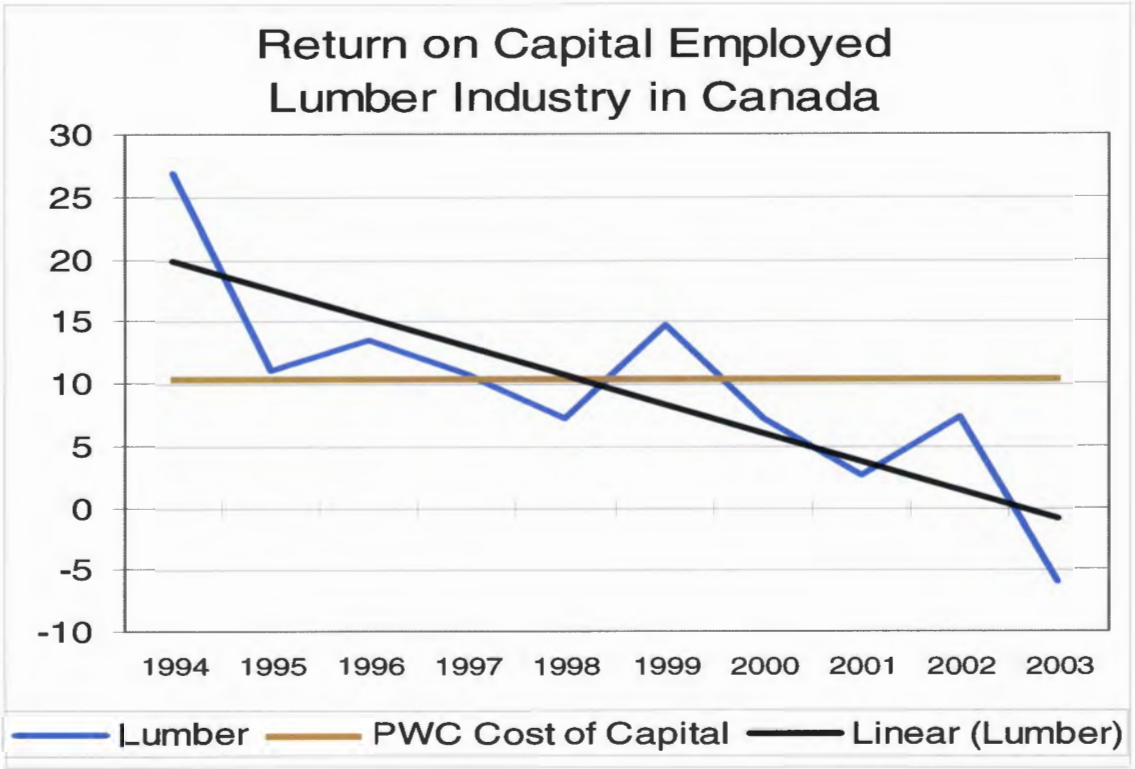
A study for the B.C. Ministry of Forests based on 2001 information estimated that basic forestry employment in the Northern Interior Forest Region accounted for 26% of total basic employment with indirect and induced employment ratios ranging from a low of 1.13 for logging in the Mackenzie District to a high of 2.14 for pulp and paper in the Prince George District (Horne 2004). Direct forestry employment in the Region is second only to the Public Sector (36% - comprised primarily of Health and Education). This underscores the importance of the forest industry to the economic well being of the region. Further, the B.C. Ministry of Forests, Revenue Branch reported that stumpage revenue for the Northern Interior Region for calendar years 2004 and 2005 were $462 million and $483 million, respectively.

LUMBER PROFITABILITY

Financial performance of the lumber and pulp segments of the forest industry in Canada for the 10-year period ending in 2003 has been mixed. Return on Capital Employed (ROCE)[3] for the lumber segment averaged 9.6% fluctuating from a high of

[3] A measure of the returns that a company is realizing from its capital. Calculated as profit before interest and tax divided by the difference between total assets and current liabilities. The resulting ratio represents the efficiency with which capital is being utilized to generate profit.

27% in 1994 to a low of negative 6% in 2003. The single largest market for Canadian lumber is the United States. Industry returns in 2002 and 2003 have been negatively impacted by countervailing and anti-dumping duties levied by the United States government.



Source: *The Forest Industry in Canada 2003*

Figure 1. Return on capital employed in the lumber industry in Canada for the ten year period 1994-2003.

SOFTWOOD LUMBER DISPUTE

The United States is the largest and most important market for softwood lumber exports from British Columbia. Exports from Canada to the U.S. rose from 3 billion board feet or 7% of U.S. market consumption in 1952 to more than 18 billion board feet or approximately 33% share in the late 1990s. Between 1996 and 2001 trade in softwood

lumber was managed under the Softwood Lumber Agreement, a voluntary export restraint agreement between the two countries.

Upon expiry of the agreement with the United States on April 2, 2001, the U.S. Coalition for Fair Lumber Imports (an ad hoc industry association in the United States) filed a countervailing duty petition and its first anti-dumping petition against Canadian softwood lumber.

Under U.S. trade law, a countervailing duty case is an investigation of an alleged subsidy that provides an importer with an advantage in the U.S. market. With lumber, the U.S. contends that provincial stumpage and log export restrictions provide a subsidy to lumber producers.

An anti-dumping case is an investigation on whether an importer is selling goods in the U.S. at prices lower than in the home market or is selling goods at prices below cost.

In 2002 the U.S. Department of Commerce (DOC) issued its final determination in the countervailing and antidumping investigations, which resulted in a countervailing duty ("CVD") rate of 18.79% and an antidumping duty ("ADD") of 8.43% being applied to softwood exports from Canada.

The federal government of Canada, various provincial governments, industry associations and in some cases individual companies all filed appeals, objections and complaints under the North American Free Trade Agreement (NAFTA), the World Trade Organization (WTO) and U.S. trade law. The government of Canada also pursued negotiations with the United States in an attempt to resolve the dispute.

On August 10, 2005 a NAFTA Extraordinary Challenge Committee unanimously upheld a NAFTA panel ruling that the evidence does not support a threat of injury by Canadian imports and confirmed the panel's instruction that the U.S. find no threat of injury. The ruling was expected to result in the removal of the CVD and ADD and a refund of cash deposits with interest. The U.S. has refused to comply with the ruling.

Effective December 12, 2005, the CVD deposit rates were reduced to 8.70% and the ADD rates were set at 2.11%, as a result of the final determination in the second Administrative Review.

No resolution has been reached in the dispute and it does not appear that one is close at hand.

INDUSTRY CONSOLIDATION

The reaction of Canadian producers has been to consolidate in order to achieve economies of scale by increasing production in order to reduce unit costs. The two largest transactions consolidating manufacturers in Northern B.C. were the acquisition of Slocan Forest Products Ltd. by Canadian Forest Products Ltd. (Canfor), and the acquisition of Weldwood of Canada Ltd. by West Fraser Timber Co. Ltd. (WFT). The two remaining firms now control 64% of lumber manufacturing capacity[4] and 73% of pulp manufacturing capacity in the Northern Interior Forest Region.

Consolidation is also a worldwide industry trend with companies looking for the following benefits:

- Operating synergies by leveraging best practices, re-allocating production from high cost to low cost plants, focusing specialized products to specific

[4] Mills with a capacity of more than 10 million board feet of lumber per year.

mills avoiding inefficiencies related to grade changes, minimizing transportation costs for raw materials and finished products, and removing duplicate fixed overhead costs.

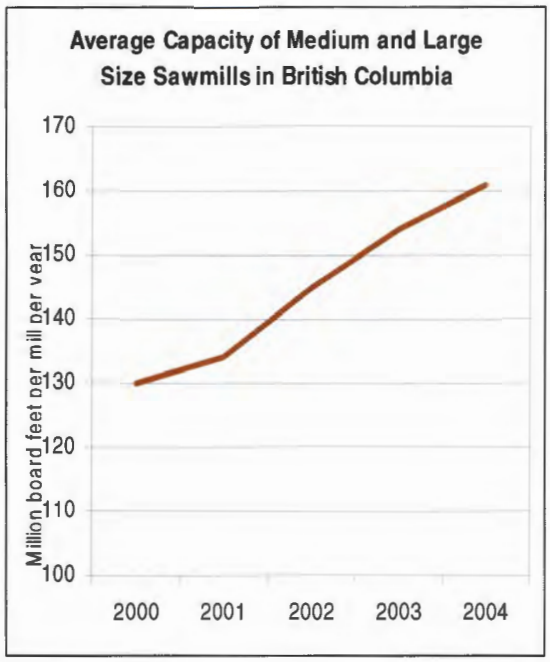
- Ability to remove redundant assets (close plants) without losing customers.
- Due to industry business cycles, seize opportunities to buy assets at a cheaper price than building.
- Rationalize capital spending with the combined entity investing in a project rather than two projects proceeding. After a combination only the best projects tend to proceed.
- Greater size tends to allow companies to achieve a lower overall cost of capital.
- Customer and supplier growth creates an incentive for companies to grow in order to provide a counterweight. At an industry level, greater concentration makes it easier to manage inventory levels through production curtailments ensuring supply meets demand leading to greater price stability.

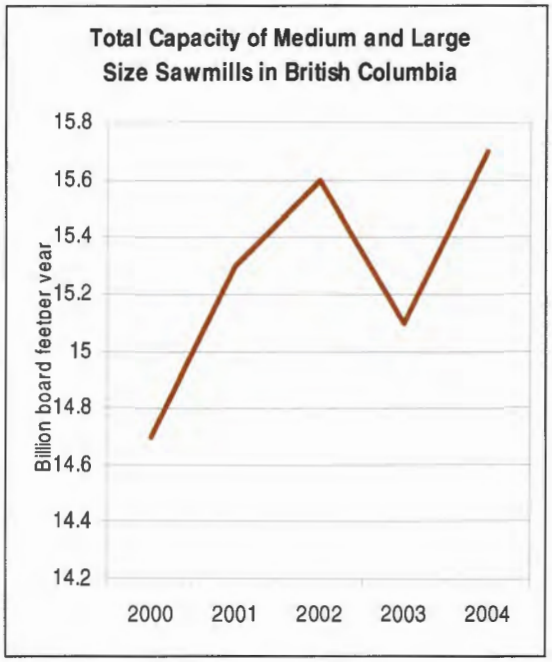
The two key product markets – pulp and lumber – that Northern B.C. industry competes in have low concentration (Roberts, et al 2005). The top five producers have less than 30% of the lumber capacity and 40% of the market pulp capacity leading to greater price volatility. In general if the top four producers own less than 40% of the market the industry is considered to be very competitive with a number of other firms competing but none owning a very large portion of the market.

NORTHEN INTERIOR LUMBER CAPACITY

Despite the softwood lumber dispute[5], total sawmill capacity in British Columbia has increased by 7% over the last five years with the average sawmill capacity increasing by 24% to 161 million board feet per year. The Northern Interior Region sawmill capacity in 2004 was 6.9 billion board feet per year or 44% of the total sawmill capacity in the province. The average capacity of the medium and large[6] size sawmills in the north is 208 million board feet per year or 54% higher than the average sawmill in the remainder of the province. The north is home to the six sawmills in the province that have capacity exceeding 300 million board feet per year; of which three are "super mills" with a capacity exceeding 400 million board feet per year.

[5] The dispute may have been responsible for the capacity decline in 2003.
[6] Medium and large size mills defined as lumber mills with estimated capacity over 40 million board feet per year.



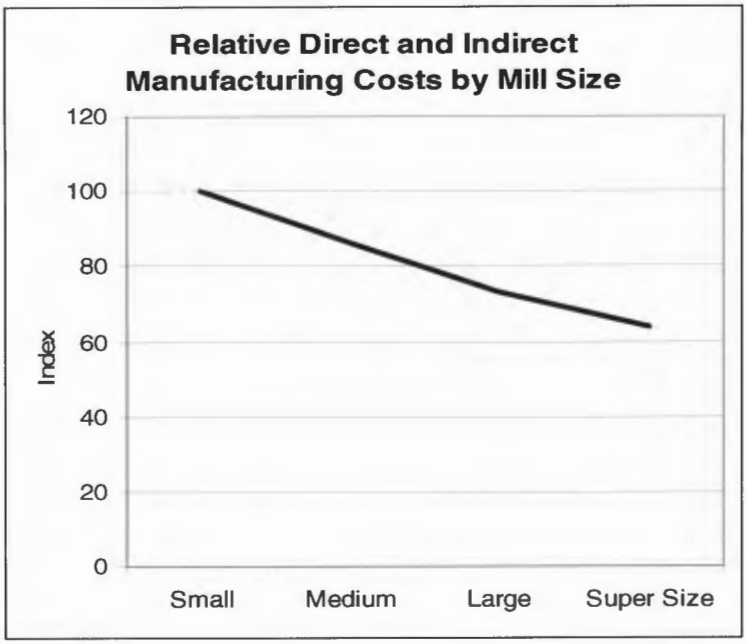


Source: *Major Primary Timber Processing Facilities in British Columbia 2004, Government of British Columbia, Ministry of Forests and Range*

Figure 2. Average capacity of medium and large size sawmills in British Columbia for the five year period 2000-2004.

Figure 3. Total capacity of medium and large size sawmills in British Columbia for the five year period 2000-2004.

PriceWaterhouseCoopers has calculated that manufacturing costs per unit decrease as capacity increases making larger mills more cost competitive. Using this measure, Northern British Columbia has a competitive advantage due to mill size.

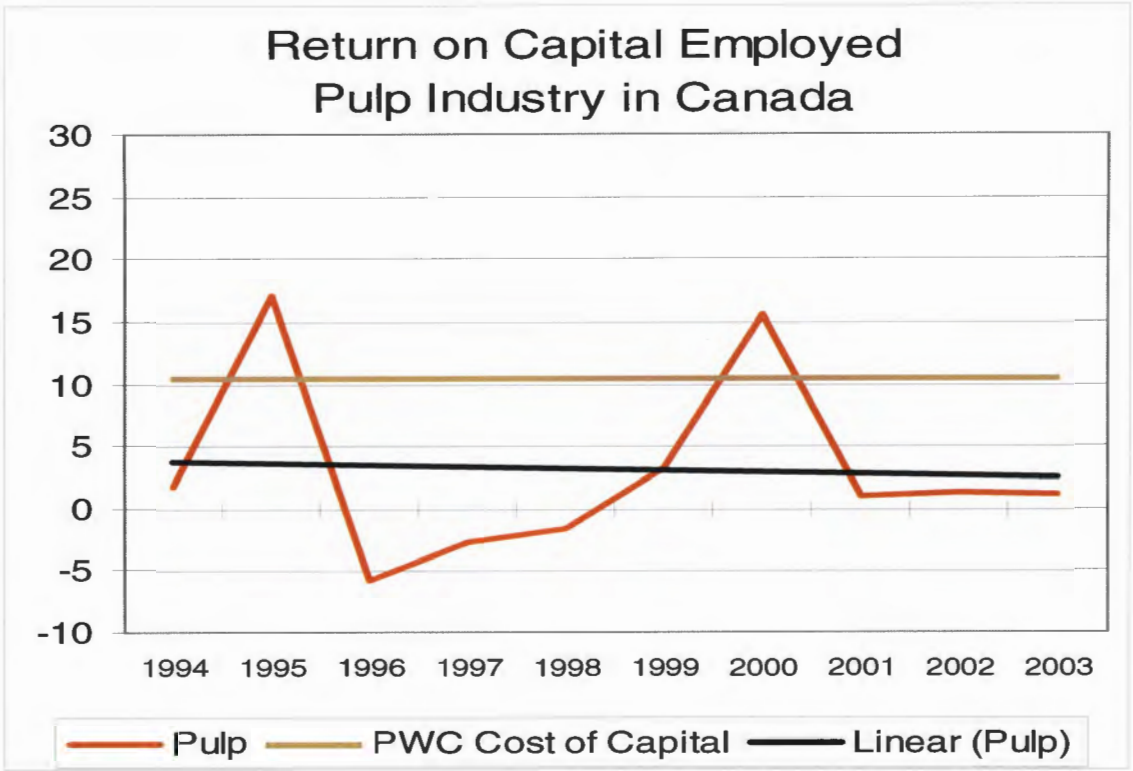


Source: *Presentation by Craig Campbell at PriceWaterhouseCoopers Global Forest and Paper Industry Conference, June 1, 2005*

Figure 4. Relative direct and indirect manufacturing costs by mill size.

PULP PROFITABILITY

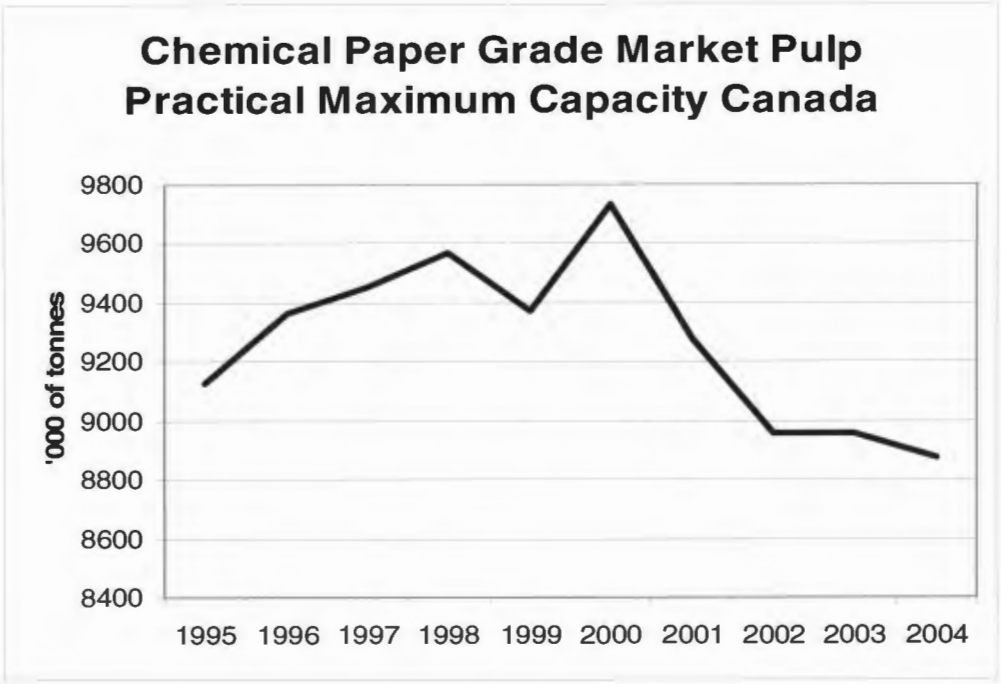
Return on Capital Employed (ROCE) for the pulp segment in Canada averaged 3.2% over the 10-year period from 1994 to 2003 fluctuating from a high of 17% in 1995 to a low of negative 6% in 1996. This is a substandard rate of return. PriceWaterhouseCoopers estimates the cost of capital for the forest industry in Canada at 9% to 12% (PriceWaterhouseCoopers 2004). With the pulp industry not earning its cost of capital reinvestment to maintain or enhance the assets will not take place and competitiveness will decline.



Source: *The Forest Industry in Canada 2003, PriceWaterhouseCoopers*

Figure 5. Return on capital employed in the pup industry in Canada for the 10 years 1994-2003.

Pulp capacity in Canada peaked in the year 2000 and has been declining over the last five years. The spike in capacity coincides with the increased returns in 2000. As the return on capital employed hovered in the 1% – 3% range pulp capacity declined.



Source: *Pulp and Paper Products Council "World Paper Grade Market Pulp Supply and Demand", September 2005.*

Figure 6. Chemical paper grade market pulp practical maximum capacity in Canada for the ten year period 1995-2004.

GLOBAL PULP MARKETS

Wood pulp is a globally traded commodity, with tonnes sold on the open market referred to as market pulp. In 2003, 93.0 percent of the world's market pulp deliveries consisted of chemical pulp, and the remaining 7.0 percent was high yield (mechanical) pulp. World demand for market pulp reached 43 million tonnes in 2003, up by 4.4 percent compared to the previous year. Most of this demand growth came from China (+770 000 tonnes) and Western Europe (+480 000 tonnes).

Canada was the world's largest market pulp supplier in 2003, with 44 mills accounting for 22 percent of global capacity. Canadian market pulp deliveries reached 10.2 million tonnes in the year. The U.S. was the second largest market pulp supplier,

with 17 percent of global market pulp capacity in 2003. U.S. market pulp deliveries reached 7.6 million tonnes.

On a regional basis, deliveries to the U.S. and Japan declined by 4.6 percent and 3.6 percent respectively from 2002. The most significant gain was reported in shipments to Asia/Africa, up 13 percent.

Table 1. Total world chemical paper grade market pulp 2003 practical maximum capacity and demand.

Total World Chemical Paper Grade Market Pulp
2003 Practical Maximum Capacity and Demand
('000 of tonnes)

Region	Supply	Demand	Balance
North America	17,695	7,250	10,445
Western Europe	11,480	17,350	(5,870)
Central Europe/Russia	3,500	1,975	1,525
Latin America	7,590	1,985	5,605
Japan	915	2,675	(1,760)
Other Asia/Africa (1)	5,905	4,235	1,670
China	-	5,085	(5,085)
South Korea	-	2,700	(2,700)
TOTAL	**47,085**	**43,255**	**3,830**

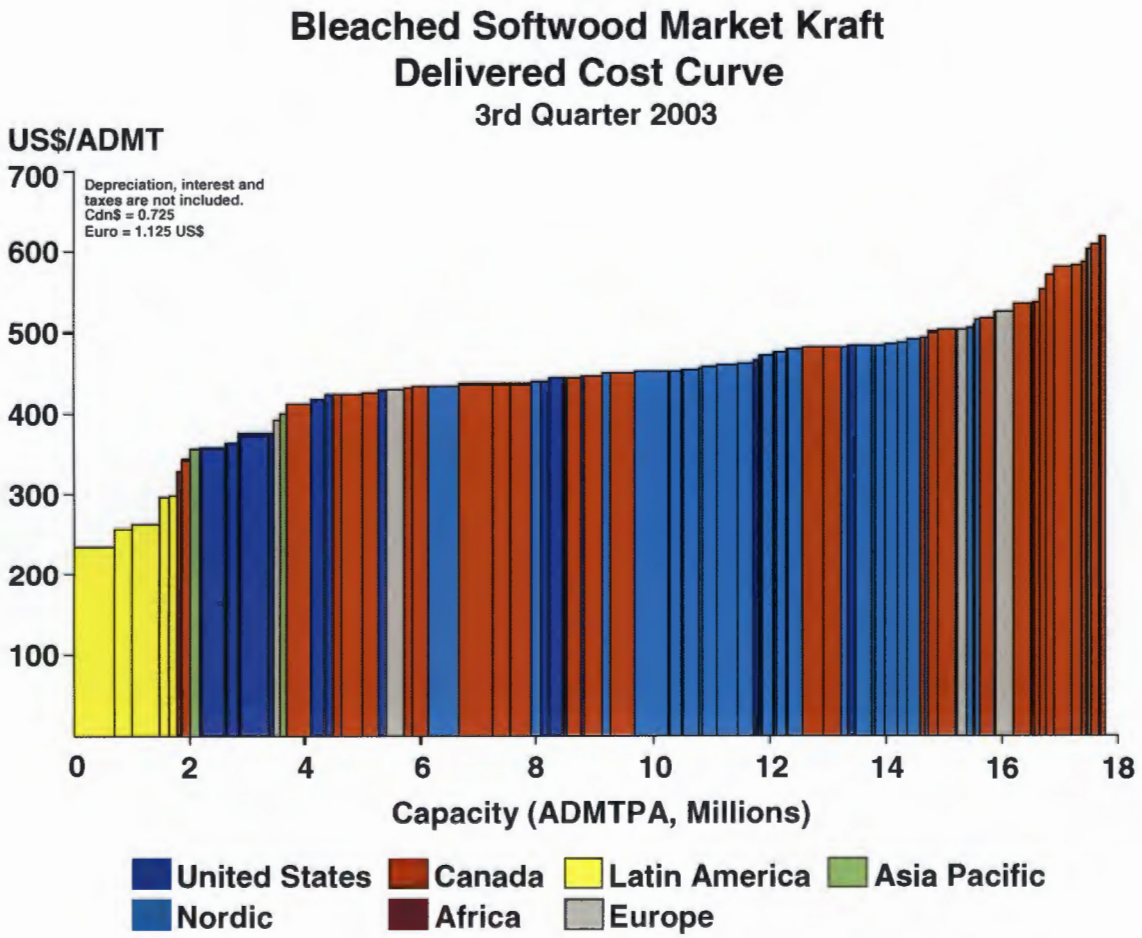
(1) Supply for Other Asia/Africa includes China and South Korea. Demand for those two countries is shown separately because it is so large. Africa has very little supply/demand.

Source: Pulp and Paper Products Council "World Paper Grade Market Pulp Supply and Demand", October 2004.

Table 1 above highlights two issues. First, there is a world supply imbalance creating supplying regions and consuming regions. The largest supplying regions are North America and Latin America, and the largest consuming regions are Western Europe and Asia (adding together Other Asia/Africa, China and South Korea there is a net consumption of 6,115,000 tonnes). This highlights the fact that pulp trade flows from the net supplying regions to the net consuming regions.

The second issue highlighted is that demand was 91.4% of supply capacity in 2003. The excess capacity creates a spirited marketplace where producers compete for market share that ultimately reduces the price.

In a fragmented, oversupplied market the price will decline until enough supply is removed to balance supply and demand. This dynamic has created the low returns for the Canadian pulp industry. The delivered cost curve below shows that mills in Latin America and the United States had a delivered cost advantage, and that many mills in Canada are at the high end of the curve.



Source: NLK Consultants Inc., Market Kraft Cost Analysis, Third Quarter, 2003

Figure 7. Bleached softwood market kraft delivered cost for the curve 3rd quarter 2003.

MOUNTAIN PINE BEETLE

In British Columbia's central interior, a mountain pine beetle infestation has been spreading since 1994. The mountain pine beetle (MPB) is an insect that attacks lodgepole pine and is widely considered to be the most damaging of all the insects that attack lodgepole pine in western Canada. The insect kills mature trees by boring through the bark and interrupting the flow of nutrients up the tree stem.

The current infestation is unprecedented in recorded history. During the last several years, both the rate of spread and the intensity of the attack have increased exponentially. Recent timber supply analyses indicate that the availability of timber in the long term will be adversely affected.

Table 2. Estimated merchantable volume (millions m3) of beetle-killed pine on the timber harvesting land base in the Lakes and Prince George Timber Supply Areas

TSA	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Lakes	0.3	1	4	9	16	21	25	30	34	38	42	46
PG	5	7	10	21	38	59	79	100	127	141	158	171
Region	5.3	8	14	30	54	80	104	130	161	179	200	217

Source*: Prince George Timber Supply Area: Rationale for Annual Allowable Cut (AAC) Determination Effective October 1, 2004, Larry Pederson, Chief Forester, Province of British Columbia.*

The outbreak has reached a stage where scientists believe that only two things can stop it:

- A winter low of -40°C or a sudden cold snap in early fall or late spring of -25°C would reduce beetle populations enough to end the outbreak.
- A depletion of susceptible hosts – all available lodgepole pine trees have been infected.

In the short-term annual allowable cut (AAC) levels throughout the central interior have been increased by 60% to mitigate the adverse effect of the infestation. The AAC in the Prince George TSA prior to the infestation was 9.4 million cubic metres annually. In 2004 the AAC was increased to 14.9 million cubic meters. By 2010 it is estimated that in the Northern Interior Forest Region it would take more than 14 years of harvesting at the increased rate to remove the infected trees.

Studies have found that there is a rapid degrade of beetle kill wood in the first one to two years post-mortality due to bluestain fungus[7], reduced moisture content and checking. Volume recovery from dead trees remains high, although lumber appearance suffers due to the bluestain fungus and checking. The literature and observations suggest that standing trees will fall to the ground before decay losses become substantial. It is estimated that standing trees will start to decay and will begin falling in seven to ten years (Lewis and Hartley 2005).

The impact on pulping requires more study, although it is clear that dry wood increases pin chips and fines making continuous digester operation a challenge and decreasing yield (Watson 2005). This will increase costs for pulp producers using these wood chips in Northern British Columbia.

ISSUES FACING THE NORTHERN B.C. FOREST INDUSTRY

The forest industry in Northern British Columbia is part of a larger Canadian forest industry that sells its products in international markets, with competitors from other regions of the world. The financial performance of the Canadian lumber industry shows

[7] Pathogenic blue-stain fungi associated with the mountain pine beetle assist the beetles in exhausting tree defences and killing trees. The fungi colonize the sapwood and produce a blue stain discoloring the wood.

that it is earning its cost of capital (as estimated by PriceWaterhouseCoopers), while the Canadian pulp industry is not. The pulp industry in Northern British Columbia was established to allow fuller utilization of the regions forests. The two segments are now closely intertwined and must earn their cost of capital to attract reinvestment and remain competitive.

Two companies, Canadian Forest Products Ltd. (Canfor) and West Fraser Timber Co. Ltd. (West Fraser) dominate sawmill and pulp mill capacity in the north. If these firms can be used as a proxy for the forest industry in the Northern Interior, a close examination of the performance of these companies could give insight into the profitability of the northern industry. Both of these companies operate lumber, pulp and panel manufacturing facilities. Are these companies earning their cost of capital? Are each of the product lines earning their cost of capital? In order to answer these questions the cost of capital for these companies and product lines must be calculated and compared to the actual returns that the firms have generated.

COST OF CAPITAL

An organization raises financial capital in order to finance its assets and operations. The cost of capital is the rate of return required to compensate providers of those funds. This rate of return serves as a benchmark to evaluate the firm's performance and also serves as the discount rate for decision-making regarding capital investments. Investments must at least return the cost of capital for the firm to properly compensate providers of the investment funds (Armitage 2005).

The financial capital of an organization consists of the two main components debt and equity. Debt financing is money that is borrowed to run the business. Long-term debt financing usually applies to assets a business is purchasing, such as equipment, buildings, land, or machinery. With long-term debt financing, the scheduled repayment of the loan more or less matches the estimated useful life of the assets purchased with the borrowings. Interest payments are set by contract so the lender knows how much the interest payments will be and when they will be made. The lending contract also specifies what occurs if the interest payments are not made as agreed, including the lender taking position of the assets in order to satisfy the outstanding obligation.

Equity financing is money acquired from the shareholders or business owners themselves. As owners of the business they have the right to the "residual" or money left after all other claims on the business have been satisfied. Shareholders are compensated through dividends and through the increased value of their shares when the firm retains earnings to reinvest in the business.

The cost of capital is meant to compensate investors for time and risk. The cost of debt is normally transparent and therefore easier to determine than the cost of equity. The cost of equity is composed of the rate for time (the "risk free rate"[8]) and compensation for risk - the "risk premium". Risk is the chance that an investment's actual return will be different than expected. This includes the possibility of losing some or all of the original investment.

The decomposition of security risk into diversifiable (or unsystemic) and undiversifiable (or systemic) risks has emerged from the portfolio approach to capital investment. The diversifiable risk can be reduced or eliminated through diversification of

[8] In practice the risk-free rate is often assumed to be the short-term Treasury note rate.

securities or assets (Ben-Horim and Levy 1980) while undiversifiable risk cannot be diversified.

The Capital Asset Pricing Model (CAPM) can be used to estimate the return required for the providers of equity capital to the firm (Armitage 2005). The components of the model include the risk-free rate (to compensate for time), the risk premium demanded by equity investors (the return generated by the stock market for all equity investments) and an adjusting factor for the firm called the "market beta". Beta is typically estimated with time-series regression, in which the dependant variable is the equity stock return and the independent variable is the market return. Variability in the market return is referred to as systemic risk, while variability in the return of an individual security in relation to the market is unsystemic or diversifiable risk.

The Capital Asset Pricing Model was the first apparently successful attempt to show how to assess the risk of the cash flow from a potential investment project. Historical returns from various types of assets show that assets with higher average returns also had more variable returns (Jagannathan and McGrattan 1995). This correspondence suggests that the higher average returns were compensation for the perceived higher risk. The asset classes measured for the 66-year period 1926 to 1991 were (in order of increasing volatility and return) U.S. Treasury Bills, U.S. Treasury Bonds, Standard & Poor's (S&P) 500-stock index, and small-firm stocks.

Empirical studies of data for stocks traded on the New York Stock Exchange during 1931-65 (Black, Jensen and Scholes 1972) and 1926-68 (Fama and MacBeth 1973) concluded that the data generally supports the CAPM.

Subsequent studies using two groups of stocks segregated based on firm size, yet with identical betas, showed a statistically significant bias in returns with the smaller firms earning a higher rate of return. This seemed to suggest that the CAPM was missing firm size as a significant factor.

Studies have also been conducted on shorter time periods. The period 1976-80 showed unusually high returns for small-stocks and Treasury bonds did poorly. During the period 1981-91 small-stock returns were lower than the S&P stocks yet the two types of assets had approximately the same beta value. This study also identified a size effect, and the ratio of book-to-market equity that seemed to do a better job of explaining cross-sectional variation in average asset returns. Questions have been raised about the data bias in this study. Empirical support has been found for the CAPM over long periods of time, and there are periods of time in which it is not found.

The reaction has been that since the CAPM is only an abstraction from reality it is unreasonable to expect it to be exactly right, and that the systemic deviations are not economically important enough to reject it.

The CAPM formula allows the calculation of the firm's cost of equity capital. The cost of debt capital is determined by the trading value of outstanding debt in the marketplace, or the interest rate on bank debt. With this information the Weighted Average Cost of Capital (WACC) can be calculated, giving the rate of return the company must earn on its assets in order to compensate investors.

Fuller and Kerr (1981), Gup and Norwood (1982) and Block (2003) among others suggest that the firm's cost of capital may not be the appropriate screening rate to evaluate investment proposals in multi-division firms where the divisions have

substantially different degrees of risk. To the extent that divisions in a corporation have degrees of risk and financial characteristics that are different from the parent corporation, using the overall hurdle rate is certain to lead to incorrect decisions and failure to maximize stockholder wealth. The major consequence of using a single hurdle rate for all projects is a misallocation of capital since the acceptance rule is biased in favour of the acceptance of high-risk projects. Low-risk divisions may not receive capital despite their ability to generate projects offering returns in excess of those required for the risk involved. The answer is to develop risk-adjusted hurdle rates for each division in a multi-division firm, such as a firm with pulp, lumber and panel divisions.

The challenge is to determine the beta required since the stock for the entire firm is traded on the stock market, and therefore the beta for the firm reflects the returns required for all divisions. Because market data for the divisions is not directly available several proxy methods have been proposed.

The "pure play" technique proposed by Fuller and Kerr (1981) requires the identification of at least one publicly traded, single industry firm to serve as a proxy for a given division. The unleveraged market beta for the firm is then used. Fuller and Kerr found that "For our sample, a weighted average of pure-play betas closely approximated the observed beta of the multi-division firm in question. This result suggests that the pure-play technique is, in fact, a valid procedure for estimating the betas of a division". The difficulty with this technique is finding one or more single product firms that closely match the products and risks of the division. In those situations where more than one pure play can be found and there is wide variation in the betas of the firms, confidence in the

technique is undermined since presumably the unleveraged betas should be identical for the group of proxy companies.

Gup and Norwood (1982) proposed combining a measure of objective and subjective risk in order to estimate the cost of capital. The objective component is a measure of the variability of net operating profits after taxes (NOPAT). The subjective component is a management judgment of the relative risk of a list of identified "risk elements". Each element is rated relative to the parent company's risk. The combination of the two elements yields a "Combined Risk Class" that identifies a hurdle rate that is relatively higher or lower than the Weighted Average Cost of Capital (WACC) for the firm (in their example 0.90 to 1.20 times). This method recognizes the relative risk of each division and allows the setting of different hurdle rates, but the hurdle rates are not calculated from market betas, and can be subject to management bias.

Bufka, Kemper and Schiereck (2004) tested the Gup and Norwood approach, along with another heuristic approach, on a number of manufacturing companies traded on the German stock exchange. Risk indexes were created based on a number of criteria and compared to market risk measures. The study results indicated that the risk measures provided some explanation for the capital market risk measures; however, the results proved to have no general applicability.

The CAPM is a single risk factor model and that risk factor is assumed to be the market portfolio. Arbitrage pricing theory (APT) allows more than one return generating factor. According to Roll and Ross (1980) "The APT demonstrates that since any market equilibrium must be consistent with no arbitrage profits, every equilibrium will be characterized by a linear relationship between each asset's expected return and its

return's response amplitudes, or loadings, on the common factors". The attractiveness of this model is that if these factors can be identified and measured it will more accurately describe the assets required returns. Roll and Ross conducted an empirical investigation of the APT and their technique of factor analysis identified the existence of three factors that influence returns, but did not attempt to identify what those factors are.

Some of the questions that researchers have examined are (Armitage):

- How many common factors are there?
- What are the common factors (in economic terms)?
- How well do multifactor models with pre-specified common factors or proxies for them explain the cross-section and time series of observed returns?
- How well do multifactor models compare with the CAPM?

The current weakness of the APT and other multi-factor models are the added complexity and doubt about exactly which variables to include. Researchers have not satisfactorily answered the questions above.

Another technique is the "accounting beta". This measure is computed by running a time series regression of the companies "basic earning power" (EBIT[9]/Total Assets) against returns on the market index. The assumption is that the systemic volatility in earnings would be one factor determining the systemic volatility in the market price. Beaver and Manegold (1975) found a statistically significant association between market betas and accounting betas, however they concluded that the accounting beta appears to be only one of the explanatory factors of the market beta. Kulkarni, Powers and Shannon

[9] Earnings Before Interest and Taxes

(1991) have proposed a method of calculating accounting betas by division (or product line) and then adjusting or reconciling the divisional betas to the market beta of the firm. Since there is an imperfect association between accounting betas and market betas the market also considers factors other than accounting earnings. Using the Kulkarni *et al* method these other factors are implicitly distributed in a neutral manner to each division. They argue that such an assumption is valid because there are risk factors over which divisional managers have no control. For example a firm's overall risk is influenced by its capital structure, but this decision is not made at the divisional level. An advantage of the proposed method is its objectivity, and the calculated hurdle rates are tied back to market risk.

Kulkarni *et al* note that the estimated beta of individual firm product lines using a limited sample of data may have potentially large estimation errors. For this reason aggregate product-line betas should be used to minimize measurement error and provide a superior basis for allocating the firm's cost of capital across divisions. This requires identifying firms in substantially the same business and accounting beta information that is not readily available. This method has the same drawbacks as the pure-play technique proposed by Fuller and Kerr (finding proxy firms) with the additional complication of requiring calculations to identify the accounting beta.

The discussion concerning CAPM, APT, heuristic risk models and accounting betas are methods of identifying the appropriate rate of return for an equity investment in a risky asset. Borrowing, from whatever source, while maintaining a fixed amount of equity, increases the risk to the equity investor. Therefore the covariance of the asset's return with the market portfolio's rate of return (the asset "beta") should be greater for

the stock of a firm with a higher debt-equity ratio than for the stock of another firm in the same risk class with a lower debt equity ratio (Hamada 1972). How much difference does capital structure make and should it be taken into account?

Modigliani and Miller (1958) looked at this question and came up with several proposals. Proposition I states that the market value of any firm is independent of its capital structure, or said another way, the average cost of capital to any firm is completely independent of its capital structure and is equal to the capitalization rate of a pure equity stream of its class. Proposition II states that the expected yield of a share of stock is equal to the appropriate capitalization rate for a pure equity stream in the class, plus a premium related to the financial risk. Proposition III states that regardless of the financing used, the marginal cost of capital to a firm is equal to the average cost of capital, which in turn is equal to the capitalization rate for an unlevered stream in the class to which the firm belongs. These propositions assumed a world of no tax and perfect capital markets.

Hamada (1972) tested the Modigliani and Miller Propositions I and II and found results supported the propositions. He estimated that 21 to 24% of the observed systemic risk of common stocks can be explained merely by the added financial risk taken on by the underlying firm with its use of debt and preferred stock. His conclusion is that corporate leverage does count considerably.

Fuller and Kerr (1981), in testing the pure-play technique for beta estimation of a division, concluded that differences between the division's and pure-play's capital structure can be disregarded when estimating the divisional beta since the pure play proxy betas (unadjusted for differences in leverage) provided better estimates of the

multidivision firm betas than did the leverage adjusted proxy betas. They did caution that this result is inconsistent with other studies and would require further validation. Their recommended procedure for estimating the overall cost of capital for a division would be to:

1. Use a pure play beta to estimate the divisional beta and thus the divisional cost of equity capital.
2. Use the overall cost of debt for the firm as the divisional cost of debt.
3. Use an internally-generated target debt ratio as the divisional debt ratio.

METHODOLOGY

Since Canfor and West Fraser now control 64% of lumber manufacturing capacity and 73% of pulp manufacturing capacity in the Northern Interior Forest Region, These companies will be used as a proxy for the forest industry in the north. Shares of both of these firms have been traded on the Toronto stock exchange for a number of years. The review of methods for calculating the appropriate rate of return for a risky asset showed that no method has yet been discovered that identifies and captures all of the factors that influence the returns expected by equity investors. The information required to use CAPM is readily available and although elements of this model have been questioned, it has been proven as a valid pricing tool so this method will be used.

In order to calculate divisional or product line cost of capital the Fuller and Kerr method of "pure-play" proxy betas will be used to price the equity capital. For

each product line an equivalent firm trading on the Toronto stock exchange will be identified and its stock beta will be used in the CAPM formula to calculate the equity cost of capital.

Since Modigliani and Miller as well as Hamada both found that capital structure will have an impact on the value of equity securities, the "pure-play" proxy firm betas will be adjusted for leverage to calculate the underlying asset beta, and then re-leveraged at the target debt ratio for Canfor and West Fraser as suggested by Fuller and Kerr.

The following steps will be used to determine if the target firms are earning their cost of capital.

1. Calculate the Weighted Average Cost of Capital.
    a. Calculate the cost of equity.
    b. Calculate the cost of debt.
2. Calculate the actual return on capital to compare to the WACC.
    a. Compare book share value to market share value.

These calculations will determine the cost of capital and the actual rates of return for all product lines of the two firms. Comparing book share value to market share value is an interesting indicator of whether the market believes that the firms selected are earning returns that support their book value.

Proceeding further, the weighted average cost of capital will be calculated for each product line. As described earlier, proxy betas will be used to calculate required returns on equity and existing debt ratios are assumed to be the target debt ratios to calculate the product WACC.

The following formula will be used to calculate WACC (Armitage 2005):

$$WACC = R_{EL}E_L/V_L + R_D(1 - T_C)D/V_L$$

Where:

R_{EL} = Expected rate of return on levered equity after corporation tax.

E_L = Market Value of Equity given a leverage L.

V_L = Market Value (equity + debt) of the firm levered.

R_D = Cost of debt for levered debt.

T_C = Effective corporate tax rate.

D = Market Value of debt.

The most difficult variable to determine is the expected return on equity. The CAPM formula will be used to calculate the required equity returns. Following is the CAPM formula for the equity cost calculation (Armitage 2005):

$$R_{EL} = R_F + \beta_L[E(R_M) - R_F]$$

Where:

R_{EL} = Expected rate of return on levered equity after corporation tax.

R_F = Risk-free rate of interest.

β_L = Leveraged Beta of the equity.

$E(R_M)$ = Expected return on the market portfolio.

The CAPM is a single period model while forest industry investment is undertaken with a long-term horizon. In order to recognize the long-term horizon, the risk free rate must be the return expected on long-term government bonds. The average return on long-term Government of Canada bonds during the January 2000 to February 2006 period is 5.31% per year (Appendix 1).

Since Canfor and WFT are both listed on the Toronto Stock Exchange (TSX) their betas will be calculated using that index as the independent variable. Berkowitz and Qiu (2001) calculated the average monthly stock market risk premium over the period of February 1982 to June 1999 or 209 months. The firms in the sample were those having data available on both the Canadian Financial Markets Research Centre Database (CFMRC) and the Compustat Canadian Database over the January 1982 through December 1999 period. Their proxy for the market factor is the total monthly return on the CFMRC value weighted portfolio less the 30-day return on T-Bills[10]. The calculated return for the market factor is 4.71% per year.

The market value of equity is used when calculating the Weighted Average Cost of Capital. The formula for determining the market value of equity is:

Market Value of Equity = Number of shares issued x Market value per share

The market value per share fluctuates as investors are willing to pay more or less for a share of the firm. In order to remove daily fluctuations in the value of shares, a monthly average price will be used to calculate the market value of equity. The study period is the five years 2000 – 2004. The average market price of an equity share during the month of January, 2005 will be used in order to reflect all of the events occurring during the study period.

[10] Berkowitz and Qiu (2001) comment "The CFMRC value weighted portfolio consists of 3361 domestic common equities. The return on the TSE300 composite was also used to represent the market with negligible differences from the results reported in the paper."

As mentioned, the Toronto Stock Exchange will be used to calculate the stock betas of Canfor and West Fraser to be used in the CAPM equation. Since both the company stock and the exchange values change on a daily basis, the stock beta will change over time. The correlation is typically based on a two or three year time period. For the purposes of this study the betas for all firms are from RBC Investments Action Direct Online Investing website on March 18, 2006. The source is a respected financial services firm in Canada. Although the beta used is not directly from the study period, the nature of betas is that they do not change materially over short periods of time unless affected by significant events. There have been no such events affecting the firms used in this study.

The actual cost of debt can be used in the WACC calculation if the interest rates reflect current market rates for the risk class to which the firm belongs. Otherwise the debt must be adjusted to match current market rates.

This method will allow the calculation of the Weighted Average Cost of Capital, or the returns the firms must earn in order to compensate the providers of debt and equity funds.

Comparing the market value of the firm to the book value of capital employed shows whether the firm is earning the expected returns. Assuming the value of the firm is dictated by the expected future cash flows, a market value in excess of the book value capital employed implies that the firm is earning returns that exceed its cost of capital. Conversely, if the market value is below book value, the firm is not earning returns that adequately compensate the providers of capital.

Looking further into the cost of capital for Canfor and WFT, it can be broken down into their three divisions, Lumber, Panel and Pulp. Using the Fuller and Kerr (1981) methodology, a proxy firm for each of the divisions will be used to determine the appropriate beta for the CAPM formula. Since the leverage used by proxy firms may be different than Canfor or WFT, the unleveraged betas (or asset betas) will be calculated using the following formula:

$$\beta_U = (E_L / V_L)\, \beta_L$$

Where:

β_U = Unleveraged Beta of the equity.

V_L = Market Value (equity + debt) of the firm levered.

E_L = Market Value of Equity given a leverage L.

β_L = Leveraged Beta of the equity.

Continuing with the methodology recommended by Fuller and Kerr (1981), the asset beta can then be leveraged at the ratio for Canfor and WFT using existing leveraging as the target for the firms and using the overall cost of debt to the firm as the divisional cost of debt and in this way calculate the divisional WACC.

Finally, the actual rates of return for the firms and for each division will be calculated using the following formula:

$$R_{BA} = NOPAT / BA$$

Where:

R_{BA} = Return on Book Assets

NOPAT = Net Operating Profit After Tax

BA = Book Asset value

APPLICATION TO NORTHERN B.C. COMPANIES

Canfor Corporation is an integrated forest products company with operations primarily in British Columbia and is listed on the Toronto stock exchange (CFP). John Prentice and Poldi Bentley founded the company in 1938 in New Westminster, B.C. Canfor became a public company on June 27, 1983.

Canfor produces softwood lumber, northern bleached softwood kraft pulp (NBSK), bleached chemi-thermo mechanical pulp (BCTMP), kraft paper, plywood, remanufactured lumber products, oriented strand board (OSB), hardboard paneling and other wood products. All of these facilities are supplied with timber from Canfor's forest operations in British Columbia, Alberta, and Quebec. The forest operations are located almost exclusively on public lands held under long-term forest tenure agreements with the province of British Columbia.

Canfor is the largest producer of SPF (Spruce-Pine-Fir) lumber in the world, with annual production of 5.2 billion board feet. This is accomplished through 19 sawmills in British Columbia, two in Alberta and one in Quebec. The company also operates three remanufacturing facilities, two in BC and one in Washington State. As well, the company operates three finger-joint plants, two in BC and one in Alberta.

Canfor is also one of the largest producers of NBSK in Canada with two pulp mills and one pulp and paper mill located in Prince George, BC. As well Canfor owns a BCTMP pulp mill in Taylor BC. Canfor owns 50% of an NBSK pulp and newspaper plant in Howe Sound. Canfor has written off its investment in this mill and its financial results are not consolidated with Canfor.

Panel production at Canfor is through two plywood plants, one in Prince George and one in Fort Nelson as well as an OSB plant in Fort Nelson. The company is also a 50% partner in a new OSB plant being constructed in Fort St John that is expected to begin production in the fall of 2005.

To provide fibre to these plants, Canfor has 13 million cubic meters of forest tenure.

In April, 2004 Canfor acquired Slocan Forest Products Ltd., another forestry company with extensive operations in British Columbia. By the end of 2004, Canfor owned 45% of lumber capacity, 55% of pulp capacity, and 41% of panel capacity in the Northern Interior B.C. forest district – a dominant position (appendix 2 and 3). The Slocan acquisition increased Canfor's northern interior lumber capacity from 33% to 45%, pulp capacity from 46% to 55% and panel capacity from 7% to 41%. The Slocan acquisition only impacts 2004 financial results from April 1 forward. Prior to the Slocan acquisition Canfor owned a material portion of the Northern Interior capacity and therefore makes a good proxy for the industry in the north.

Table 3. Canfor Corporation and Slocan Forest Products Ltd. geographic distribution of manufacturing capacity by product line.

Mill Operations and Capacities			
	Canfor	**Slocan**	**Combined**
Lumber North	75%	49%	66%
Lumber Other	25%	51%	34%
Pulp North	100%	100%	100%
Pulp Other	0%	0%	0%
Panel North	100%	100%	100%
Panel Other	0%	0%	0%

Canfor and Slocan also own operations outside of Northern British Columbia. Table 3 shows the proportion of each company's manufacturing capacity that is located

in Northern British Columbia. Prior to the Slocan purchase, 75% of Canfor's lumber manufacturing capacity was in the north, 100% of pulp and 100% of panels. This again makes Canfor a good proxy for the Northern British Columbia Forest Industry.

West Fraser Timber Co. Ltd. is an integrated forest products company with operations primarily in British Columbia and Alberta and is listed on the Toronto Stock Exchange (WFT). West Fraser began operations in 1955 when three brothers Henry H. Ketcham Jr., William P. Ketcham, and Samuel K. Ketchum paid $15,000 to acquire a small lumber planing mill in Quesnel, British Columbia. In 1957, the brothers were approached with an offer to take over a near bankrupted mill near Williams Lake, B.C. This acquisition led to the beginning of West Fraser Timber Company, which is the name the company continues to use today. The company continued to expand its operations from 1957 to 1979 through the acquisition of sawmills and timber rights in the interior of British Columbia. In 1979 West Fraser entered the pulp industry by forming a joint venture with the Japanese company Daishowa. Together these two companies constructed and operated Quesnel River Pulp, in Quesnel B.C. West Fraser continued its expansion when it acquired a 40% interest in Eurocan Pulp and Paper Co., in 1981. This moved the company into the kraft paper and containerboard market and as well included interest in two joint venture sawmills and two independent sawmills. In 1985 Hank Ketchum III became President and CEO of West Fraser, and a year later he took the company public. By 1993, West Fraser had expanded its ownership in Eurocan Pulp and Paper Co. to 100%. During this time, West Fraser also entered into a joint venture to construct and operate a newsprint mill at Whitecourt, Alberta. In 1995, the company

continued to expand their pulp and paper business with the acquisition of the Slave Lake Pulp Mill in Alberta.

In the years after 1995, West Fraser focused on its solid wood business, a return to what it considered its core competencies. In 1995, West Fraser acquired the Blue Ridge sawmill and the Ranger Board MDF plant both in Blue Ridge, Alberta. In 1996, West Fraser developed the WestPine MDF plant in Quesnel. West Fraser acquired Zeidler Forest Products in 1999, whose assets included a plywood plant in Edmonton and a stud mill and veneer plant in Slave Lake, Alberta (renamed Alberta Plywood). In 2000, West Fraser acquired a 50% interest in a sawmill in Red Earth, Alberta. In 2000, West Fraser moved across the border with the acquisition of two sawmills in the southern United States, located in Joyce, Louisiana and Huttig, Arkansas.

In 2001 West Fraser acquired a sawmill in Chasm, B.C. from Ainsworth Lumber Co. Ltd and converted the existing stud mill into a dimensional lumber sawmill. By the end of 2002, West Fraser had increased its ownership in Quesnel River Pulp to 100%.

On December 31, 2004 West Fraser completed the acquisition of Weldwood of Canada Ltd. and became the third largest lumber producer in North America. The acquisition included four sawmills that were wholly owned by Weldwood, two in British Columbia and two in Alberta. Also acquired was an interest in three joint venture sawmills in British Columbia increasing West Fraser's interest in the Burns Lake and Decker Lake mills from approximately 32% to 90% and from 50% to 100% in the Houston mill. In addition, two plywood plants and a lumber treating facility in British Columbia and a laminated veneer lumber plant and lumber treating facility in Alberta were added.

West Fraser also became a producer of NBSK pulp acquiring a pulp mill in Alberta and 50% ownership in a mill in British Columbia. Finally, the addition of Weldwood increased West Fraser's timber tenures to 12 million cubic meters of annual allowable cut per year.

Since the acquisition took place at the end of 2004 West Fraser's operating results for 2004 and prior years do not include the Weldwood operations. With the Weldwood acquisition West Fraser owns 22% of lumber capacity, 19% of pulp capacity, and 0% of panel capacity in the Northern Interior B.C. forest district. The Weldwood acquisition increased West Fraser's northern interior lumber capacity from 17% to 22%, pulp capacity remained unchanged at 19% and panel capacity was also unchanged at 0%. Prior to the Weldwood acquisition West Fraser owned a portion of the Northern Interior capacity and therefore is influenced by the results of industry in the north.

Table 4. West Fraser Co. Ltd. and Weldwood of Canada Ltd. geographic distribution of manufacturing capacity by product line.

Mill Operations and Capacities			
	West Fraser	**Weld-wood**	**Combined**
Lumber North	43%	28%	38%
Lumber Other	57%	72%	62%
Pulp North	40%	0%	26%
Pulp Other	60%	100%	74%
Panel North	0%	0%	0%
Panel Other	100%	100%	100%

Table 4 shows that 43% of West Fraser's lumber capacity and 40% of its pulp and paper capacity are in the Northern Interior.

Table 5. Calculation of weighted average cost of capital for Canfor and West Fraser

Weighted Average Cost of Capital		
Capital Structure - $Millions		
	Canfor	**WFT**
Long term debt	213	276
Other	749	200
Market Equity	2,216	1,990
Total	3,178	2,466
Thousands of shares	142,512	42,757
Share market value	15.55	46.54
Cost of Capital		
Equity		
Risk Free Rate	5.31%	5.31%
Market Premium	4.71%	4.71%
Beta	0.85	0.32
Cost of equity	9.31%	6.82%
Long Term Debt		
LT Debt Interest	8.54%	7.23%
Income Tax Rate	36.7%	35.6%
Net of Tax	5.41%	4.66%
Proportion		
Long term debt	7%	11%
Other	24%	8%
Equity	70%	81%
Total	100%	100%
Cost		
Long term debt	5.41%	4.66%
Other	0.00%	0.00%
Equity	9.31%	6.82%
WACC	**6.85%**	**6.02%**

Table 5 shows the calculation of the weighted average cost of capital for Canfor and West Fraser. The capital structure of both companies is comprised of long-term debt, shareholder equity and other. Long term debt is money that is borrowed, is not repayable in the next year, and requires interest to be paid on the borrowed funds. Shareholder equity is money contributed by the owners, and previous year earnings not paid out to the owners, but retained in the company. Other is long term (not payable within the next year) accruals and provisions for items such as future income taxes, reforestation, countervailing duties, pension and post-retirement benefits. These liabilities do not require the payment of interest and the companies can use these funds without cost until the obligations are due.

The risk free rate and market premium used were discussed earlier. The stock beta is from RBC Investments Action Direct Online Investing website on March 18, 2006. The market prices for shares are the monthly average for January, 2005 which is shortly after the financial results used in the calculations of book return on assets. In other words, the share prices should reflect the company performance of the 2004 year just completed. Canfor's weighted average cost of capital at 6.85% is higher than West Fraser at 6.02%. Most of the difference is due to Canfor's higher cost of equity capital. Canfor has a higher beta which means investors require a higher risk premium for Canfor equity. Canfor also has a higher proportion of debt in their capital structure. Higher debt increases financial risk and may contribute to Canfor's higher stock beta.

Canfor's actual average Return on Book Assets over the five year period 2000 – 2004 was 5.3%. This indicates that the company did not earn the return required to compensate investors over this five year period. The required return is 6.85%.

Table 6. Calculation of Canfor Corporation return on assets for the five years 2000-2004 and five year average.

CANFOR	2004	2003	2002	2001	2000	Five Year Average
Working Capital*	418	254	277	342	66	271
Fixed Assets	2219	1444	1395	1436	1484	1596
Other	292	227	259	266	231	255
Total Assets	2929	1925	1931	2044	1781	2122
*Excluding excess cash						
Long term debt	213	478	643	715	401	490
Other	749	358	334	368	429	448
Equity	1967	1089	954	961	951	1184
Total Investment	2929	1925	1931	2044	1781	2122
Operating Profit	522	-3	55	63	264	180
NOPAT	331	-2	35	38	156	112
Return on assets	**11.3%**	**-0.1%**	**1.8%**	**1.9%**	**8.8%**	**5.3%**

NOPAT: Net Operating Profit after Tax

Looking at the results for West Fraser over the same five year period the average Return on Book Assets was 6.9%. This is higher than West Fraser's weighted average cost of capital of 6.02%. West Fraser as a company has performed better than Canfor and has earned the returns required to compensate investors.

Table 7. Calculation of West Fraser Timber Co. Ltd. return on assets for the five years 2000-2004 and five year average.

WEST FRASER - $Millions	**2004**	**2003**	**2002**	**2001**	**2000**	**Five Year Average**
Working Capital*	437	259	307	287	322	322
Fixed Assets	1214	1246	1318	1332	1274	1277
Other	104	86	104	223	396	183
Total Assets	1755	1591	1729	1842	1992	1782
*Excluding excess cash						
Long term debt	276	287	338	360	571	366
Other	200	249	267	306	310	266
Equity	1279	1055	1124	1176	1111	1149
Total Investment	1755	1591	1729	1842	1992	1782
*2004 adjusted to exclude Weldwood acquisition at year end						
Operating Profit	288	9	209	187	279	194
NOPAT	185	6	136	113	174	123
Return on assets	**10.6%**	**0.4%**	**7.9%**	**6.1%**	**8.7%**	**6.9%**

NOPAT: Net Operating Profit after Tax

The graphs below compare the market price of Canfor and West Fraser shares to their book values over the same five year period (and extending into 2005). The book value shown is the closing value at the end of the preceding year. The market values are monthly average trading values from Yahoo Finance downloaded on March 15, 2006.

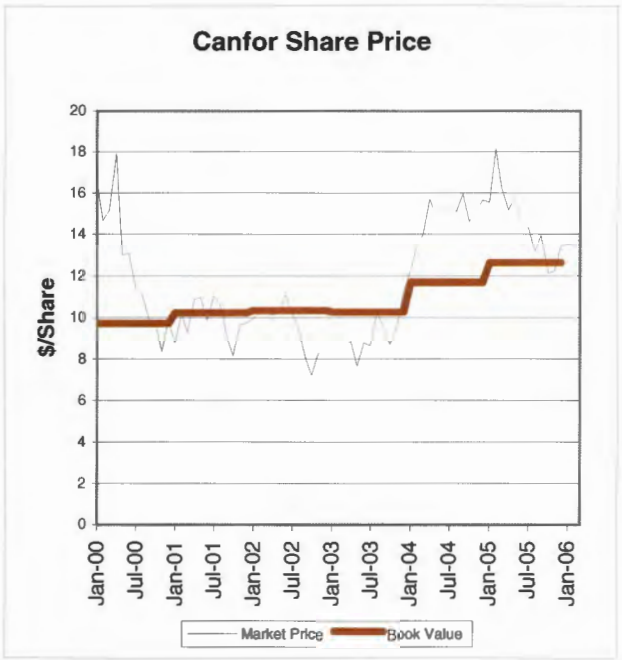


Figure 8. Canfor Corporation market share price and book value per share for the 62 months January 2000 to February 2006.

Figure 9. West Fraser Timber Co. Ltd. market share price and book value per share for the 62 months January 2000 to February 2006.

Over the five year period the market values generally track the book values closely which supports the previous calculations showing that both Canfor and West Fraser have been close to earning their weighted average cost of capital.

COST OF CAPITAL BY PRODUCT LINE

Both Canfor and West Fraser have the three major product lines of lumber, pulp and panels. These three divisions may have different risk profiles which would lead to a different cost of capital since rational investors require higher returns from investments that have higher volatility. Using the Fuller and Kerr methodology, a proxy firm is required to estimate the market and asset betas for the product lines. The proxy firm must trade on the Toronto Stock Exchange (TSX) because the betas for Canfor and West

Fraser were calculated using that exchange. The number of "pure-play" firms conducting business in these product lines trading on the Toronto Stock Exchange is very limited. The pool is not large.

The lumber firm chosen is International Forest Products Ltd. (Interfor). The Company has operations in British Columbia, Washington and Oregon, including five sawmills in the Coastal region of B.C., one in the B.C. Interior, two in Washington and one in Oregon. Interfor also operates a number of value-added remanufacturing and specialty products facilities in B.C. and Washington. The company was founded in 1963 and has grown to a rated capacity of 1.2 billion board feet of lumber per year generating $833 million in revenue during 2004.

The pulp firm chosen is SFK Pulp Fund. The company operates a mill located in Saint-Felicien, Quebec and employs approximately 325 people. The mill has an annual production capacity of 375,000 metric tonnes of high quality northern bleached softwood kraft (NBSK) pulp. Management believes the mill is one of the lowest cost producers of NBSK in North America. The mill supplies NBSK pulp to various sectors of the paper industry in Canada, the United States and in Europe for use in specialty products. Revenue in 2004 was $269 million and was generated exclusively by pulp sales.

The mill commenced operation in 1978 and in 2002 then owner Abitibi Consolidated Inc. formed SFK Pulp Fund and sold 70% of the ownership to numerous fund holders.

The Panel firm chosen is Ainsworth Lumber Company Ltd. The company was incorporated in 1956 and was the owner of a sawmill operation in 100 Mile House, British Columbia. The company grew in lumber until 1993, when it used an Initial Public

Offering to raise $51.4 million to build an OSB plant in 100 Mile House. The company then continued to grow in Panel products through acquisition and construction. The company sold its last sawmill operation in 2001. In 2004 the company generated $909 million in sales and by year end had manufacturing capacity of 3,355 mmsf of oriented strand board (OSB) and 155 mmsf of veneer and plywood.

Table 8. Calculation of asset or unlevered betas.

Calculation of Asset Betas

Capital Structure-$Millions	Canfor	WFT	Lumber Interfor	Pulp SFK	Panel Ainsworth
Long term debt	661	276	74	100	917
Other	749	200	33	13	79
Market Equity	2,216	1,990	346	437	455
Total	3,626	2,466	453	550	1,451
Shares outstanding	142,512	42,757	48,678	59,250	14,649
Share market value	15.55	46.54	7.10	7.37	31.05
Book Equity Value	1,967	1,279	373	461	300
Equity	61%	81%	76%	79%	31%
Levered Beta	0.85	0.32	0.32	0.38	0.28
Unlevered Beta	**0.52**	**0.26**	**0.24**	**0.30**	**0.09**

Table 8 shows the calculation of the unlevered or asset betas by product line. All of the betas are very low and the beta for Panel products is exceptionally low. This may reflect the very strong panel prices since mid 2003. The market value of equity is the average share price during the month of January, 2005 in order to capture the impact of 2004 operations in share prices.

Table 9. Calculation of levered beta by product line for Canfor Corporation.

Product Line Betas	Canfor	Lumber	Pulp	Panel
Unlevered beta	0.59	0.24	0.30	0.09
Levered beta	0.85	0.35	0.43	0.13
Average assets - $millions	2,122	1,164	902	55
Asset weighted product levered beta	0.38			
Canfor adjusted levered beta by product	0.85	0.78	0.97	0.28

Applying the unlevered proxy betas to Canfor, and relevering them using Canfor's debt levels as the target debt level for each product line results in product betas that are below Canfor's company beta. Calculating a company beta for Canfor using the levered proxy betas and a five-year weighted average asset value by product line results in a beta that is only half of Canfor's actual company beta (see table above – asset weighted levered beta of .38 vs actual beta of .85). Canfor's stock price is significantly more volatile than expected given the product lines that Canfor produces. This increases the cost of equity capital to Canfor.

In order to calculate the cost of capital for Canfor by product line the unexplained difference in the beta can be allocated to the product lines based on the five-year average asset value. This adjusted beta is then used to calculate the WACC of Canfor by product line. Canadian Generally Accepted Accounting Principles require that segmented information is reported in annual financial reports. That information was used to identify assets and net operating profit after tax by product segment for the years 2000 - 2004. This actual return on assets can then be compared to the adjusted product line WACC.

Table 10. Comparison of five years 2000-2004 actual return on assets to product line WACC for Canfor Corporation.

Canfor	2000-2004 Actual Return on Assets	Product line WACC
Lumber	5.4%	6.6%
Panels	24.3%	5.0%
Pulp	3.8%	7.3%
Total	**5.2%**	**6.9%**

The return on assets by product line table shows that the panels segment returns far exceeded its WACC. Lumber and pulp did not pay for their cost of capital with pulp returning slightly more than half of the required profits on assets. Although lumber fared better, that segment was short of required returns by 1.2%.

Table 11. Calculation of levered beta by product line for West Fraser Timber Co. Ltd.

Product Line Betas	West Fraser	Lumber	Pulp	Panel
Unlevered beta	0.26	0.24	0.30	0.09
Levered beta	0.32	0.30	0.37	0.11
Average assets - $millions	1,782	802	734	245
Asset weighted product levered beta	0.31			
WFT adjusted levered beta by product	0.32	0.32	0.39	0.11

The levered beta for West Fraser is very close to the asset weighted product line levered beta. The pure-play proxy firms explain the West Fraser beta of .32 closely with the asset weighted product line levered beta at .31.

Table 12. Comparison of five years 2000-2004 actual return on assets to product line WACC for West Fraser Timber Co. Ltd.

West Fraser	2000-2004 Actual Return on Assets	Product line WACC
Lumber	10.4%	6.0%
Panels	8.4%	5.2%
Pulp	2.6%	6.3%
Total	**6.9%**	**6.0%**

The asset weighted product line betas for West Fraser can then be used to calculate the West Fraser product line cost of capital. For the five-year period 2000 to 2004 West Fraser return on assets for the lumber and panel segments significantly exceeded the product line weighted average cost of capital. The pulp segment, however, returned less than half the required operating income for the investment in assets.

SUMMARY AND CONCLUSIONS

It is important to note a limitation in the Fuller and Kerr pure-play technique of beta estimation for determining the cost of capital by product line in a multi-product firm. The comparison firm used must be a close match in order for the resulting cost of capital calculation to be representative for the division. It is a common practice to identify several pure-play firms in order to ensure that the beta used is appropriate. Unfortunately, there are few pure-play firms in the product lines of lumber, pulp and panels. The three firms used are the best proxy firms available, but are not exact matches for the business lines of Canfor and West Fraser. The operations of International Forest Products Ltd, the proxy firm used for lumber, are primarily located in coastal areas where operating conditions and risks can be different than the Northern Interior region. SFK Pulp has only one operation and it is located in Eastern Canada, and again the operating conditions can be different. Ainsworth has operations in both Eastern and Western Canada with several being located very close to Northern B.C. Without further evidence that the betas from the proxy firms used are appropriate for these product lines, there is a possibility that the cost of capital used in this study is not the true cost of capital for these business lines.

Canfor, which is a better proxy for the Northern British Columbia forest industry than West Fraser because 66% of their lumber capacity, 100% of their pulp capacity and 100% of their panels capacity is in the northern interior, is not earning its cost of capital. Over the five-year period 2000- 2004, the company earned 5.2% return on assets while the weighted average cost of capital for Canfor was 6.9%. Further, both the lumber and pulp segments did not generate the required returns so there is no opportunity to change the transfer price of chips in order to move returns from one segment to the other. Despite this, Canfor has been investing in sawmills in the north. The company obviously expects to be able to generate the required returns on their new investments. The panels segment performed very well and Canfor and Louisiana Pacific have recently constructed a new OSB plant in Fort St John. The pulp segment has earned only half of its cost of capital. This is a strong warning signal that the pulp industry is in danger in Northern British Columbia. If no steps can be taken to improve returns the industry is at risk of extinction. Canfor accounts for 45% of lumber capacity, 55% of pulp capacity and 41% of panel capacity in the Northern Interior.

West Fraser has earned 10.4% return on lumber assets while the WACC for that product segment is only 6.0%. West Fraser lumber capacity in the north is 43% of their total lumber capacity. This is a significant portion. The company has no panel facilities in the northern interior. West Fraser has 40% of their pulp capacity in the north (the Eurocan Pulp and Paper facility in Kitimat). The performance of West Fraser's pulp assets at 2.6% return is worse than Canfor. West Fraser has expressed concern about the performance of Eurocan in their annual report.

PriceWaterhouseCoopers used an estimated cost of capital for the lumber industry of 10.5% in their report on the forest industry in Canada 2003. They did not provide a calculation or explanation on how they arrived at this rate. Using the methodology outlined in this report, the cost of capital for the two largest firms operating in the Northern Interior of British Columbia is actually 6.0% for West Fraser and 6.9% for Canfor. Canfor is close to earning this rate and West Fraser far exceeds it.

The softwood lumber dispute has increased costs for Canadian producers shipping to the U.S. market because of the duties imposed by the United States. By the end of 2004 Canfor had accumulated duty on deposit of US$538 million. Assuming an average exchange rate of US$.85, the duties on deposit would increase net operating earnings after tax (NOPAT) by $70 million per year over the five-year period, increasing Canfor's return on lumber assets to 9.0% (exceeding their cost of capital). The dispute is having a material impact on Canadian lumber producers but there is no indication when it will be resolved, or what will be the terms of resolution. It is also unclear how much, if any, of a potential duty refund is reflected in the stock prices of lumber producers.

The recent trend to industry consolidation is not completely reflected in the financial statements of Canfor and West Fraser. The five-year period used in this analysis only captures the last nine months of the Canfor-Slocan combination and none of the West Fraser-Weldwood combination. It would be very interesting to perform this analysis after five years of post merger performance. Both Canfor and West Fraser are currently investing in new lumber mills to reduce costs and process mountain pine beetle killed logs.

As the volume of beetle killed logs increases, sawmill operating costs will increase with dry logs becoming more difficult to process. It remains unclear how readily the market will accept lumber discoloured by the bluestain fungus. These issues will be a challenge for a successful forest industry in Northern B.C.

The pulp industry has not earned the required rates of return for either Canfor or West Fraser facilities. This is a major concern for both the pulp and lumber segments. Pulp producers will not be able to attract investment capital if they cannot pay the required rate of return. Without investment capital, facilities may not remain cost competitive and high cost producers are ultimately forced out of business. The lumber producers will then have no customer for their residual chips, increasing lumber manufacturing costs.

The rates of return earned in the pulp segment during the 2000-2004 period will not sustain investment in the Northern British Columbia forest industry. Lumber is very close to earning required returns, and panels have exceeded the required return.

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Appendix 1. Selected government and corporate long term bond yields.

MONTHLY Series:

V122544: SELECTED GOVERNMENT OF CANADA BENCHMARK BOND YIELDS: LONG-TERM		
Low	12/2005	4.02
Average	01/2000 - 02/2006	5.31
High	01/2000	6.27

Source: http://www.bankofcanada.ca/cgi-bin/famecgi_fdps

MONTHLY Series:

V122518: OTHER BONDS: AVERAGE WEIGHTED YIELD (SCOTIA CAPITAL INC.) - ALL CORPORATES LONG-TERM		
Low	08/2005	5.04
Average	01/2000 - 02/2006	6.49
High	05/2001	7.36

Source: http://www.bankofcanada.ca/cgi-bin/famecgi_fdps

Appendix 2. Lumber mills in the Northern Interior Forest Region with a capacity exceeding 40 million board feet per year.

LUMBER MILLS

Mill Number	Company	Location of Mill	Forest District	Millions of Board Feet	Canfor/ WFT capacity	% of Total capacity
128	Abitibi-Consolidated Co. of Canada	Mackenzie	Mackenzie	249		
129	Abitibi-Consolidated Co. of Canada	Mackenzie	Mackenzie	201		
137	Apollo Forest Products Ltd.	Fort St James	Fort St James	130		
130	Canadian Forest Products Ltd.	Mackenzie	Mackenzie	480	3095	45%
193	Canadian Forest Products Ltd.	Houston	Nadina	442		
140	Canadian Forest Products Ltd.	Engen	Vanderhoof	347		
153	Canadian Forest Products Ltd.	Prince George	Prince George	344		
127	Canadian Forest Products Ltd.	Chetwynd	Peace	227		
166	Canadian Forest Products Ltd.	Prince George	Prince George	225		
160	Canadian Forest Products Ltd.	Bear Lake	Prince George	192		
122	Canadian Forest Products Ltd.	Fort St John	Peace	182		
135	Canadian Forest Products Ltd.	Isle Pierre	Prince George	175		
97	Canadian Forest Products Ltd.	Prince George	Prince George	140		
121	Canadian Forest Products Ltd.	Fort Nelson	Fort Nelson	101		
133	Canadian Forest Products Ltd.	Fort St James	Fort St James	240		
150	Carrier Lumber Ltd.	Prince George	Prince George	132		
737	Cheslatta Forest Products Ltd.	Ootsa Lake	Nadina	96		
158	Dunkley Lumber Ltd.	Strathnaver	Prince George	480		
558	Kispiox Forest Products Ltd.	South Hazelton	Skeena Stikine	48		
184	Kitwanga Mills Ltd.	Kitwanga	Skeena Stikine	55		
144	L & M Lumber Ltd.	Vanderhoof	Vanderhoof	168		
149	Lakeland Mills Ltd.	Prince George	Prince George	139		
732	PG Sort Yard	Prince George	Prince George	48		
136	Stuart Lake Lumber co. Ltd.	Fort St James	Fort St James	105		
181	West Fraser Mills Ltd.	Burns Lake	Nadina	73	1540	22%
191	West Fraser Mills Ltd.	Smithers	Skeena Stikine	240		
213	West Fraser Mills Ltd.	Burns Lake	Nadina	260		
532	West Fraser Mills Ltd.	LeJac	Vanderhoof	240		
552	West Fraser Mills Ltd.	Chetwynd	Peace	240		
183	West Fraser Mills Ltd.	Terrace	Kalum	168		
530	Houston Forest Products Co. (WFT)	Houston	Nadina	319		
672	Winthro Contracting Ltd.	Prince George	Prince George	23		
162	Winton Global	Bear Lake	Prince George	298		
	Number of Mills	**33**	**Totals**	**6873**	**4635**	**67%**
			Average size	**208**		

Source: *Major Primary Timber Processing Facilities in British Columbia 2004, Government of British Columbia, Ministry of Forests and Range*

Appendix 3. Pulp and paper mills and panel mills in the Northern Interior Forest Region.

PULP AND PAPER MILLS

Mill Number	Company	Location of Mill	Forest District	Thousands of Air Dry Metric Tonnes	Canfor/ WFT capacity	% of Total capacity
128	Abitibi-Consolidated Co. of Canada	Mackenzie	Mackenzie	217		
500	Canadian Forest Products Ltd.	Prince George	Prince George	302	1330	55%
500	Canadian Forest Products Ltd.	Prince George	Prince George	133		
500	Canadian Forest Products Ltd.	Prince George	Prince George	137		
503	Canadian Forest Products Ltd.	Prince George	Prince George	541		
335	Canadian Forest Products Ltd.	Taylor	Peace	217		
496	Eurocan Pulp & Paper Co.	Kitimat	Kalum	449	449	19%
505	Pope & Talbot Ltd.	Mackenzie	Mackenzie	223		
205	Tembec Industries Ltd.	Chetwynd	Peace	207		
	Number of Mills	**8**	**Totals**	**2426**	**1779**	**73%**
			Average size	**303**		

PLYWOOD, OSB, AND OTHER PANEL MILLS

Mill Number	Company	Location of Mill	Forest District	Millions of square feet 3/8"	Canfor/ WFT capacity	% of Total capacity
121	Canadian Forest Products Ltd. - PLY	Fort Nelson	Fort Nelson	302		
151	Canadian Forest Products Ltd. - PLY	Prince George	Prince George	173		
459	Canadian Forest Products Ltd. - OSB	Fort Nelson	Fort Nelson	516	991	41%
650	Louisiana Pacific Canada Ltd. - OSB	Dawson Creek	Peace	445		
357	Northern Engineer Wood Prod. – PNL	Smithers	Skeena Stikine	80		
	Number of Mills	**4**	**Totals**	**1516**	**991**	**41%**
			Average size	**379**		

Source: *Major Primary Timber Processing Facilities in British Columbia 2004, Government of British Columbia, Ministry of Forests and Range*

Appendix 4. Canfor return on assets calculation for the years 2000 – 2004 and five-year average. Slocan is not included until the purchase was completed at the start of the second quarter of 2004.

CANFOR	2004	2003	2002	2001	2000	Five Year Average	Asset Allocation
Net Operating Income After Tax							
Lumber	261	(6)	45	45	24	74	63
Panels	77	3	-	-	-	16	13
Pulp	28	15	8	8	141	40	34
Corporate/other	(35)	(14)	(18)	(22)	(9)	(20)	
Total	331	(2)	35	32	156	110	110
Identifiable Assets							
Lumber	1781	1078	976	995	967	1159	1,164
Panels	234	42	0	0	0	55	55
Pulp	911	829	876	899	978	899	902
Corporate/other	1103	499	476	485	495	612	
Current liabilities	-1100	-523	-397	-335	-659	-603	
Total	2929	1925	1931	2044	1781	2122	2122
Return on assets							
Lumber	14.6%	-0.5%	4.6%	4.6%	2.5%	6.4%	5.4%
Panels	32.7%	6.9%	0.0%	0.0%	0.0%	28.8%	24.3%
Pulp	3.1%	1.8%	0.9%	0.9%	14.4%	4.5%	3.8%
Corporate/other	-3.2%	-2.8%	-3.7%	-4.5%	-1.9%	-3.2%	
Total	11.3%	-0.1%	1.8%	1.5%	8.8%	5.2%	5.2%
Operating Income							
Lumber	412	(10)	71	75	41		
Panels	121	5	-	-	-		
Pulp	45	26	12	24	239		
Corporate/other	(56)	(24)	(28)	(36)	(16)		
Total	522	(3)	55	63	264		
Tax rate	36.7%	42.1%	36.4%	39.5%	40.9%		

Corporate and other costs are comprised of corporate, head office and information technology costs. 2004 is unusually high due to the integration of Slocan. Corporate and other assets include long-term investments, deferred charges and other assets not directly related to a business segment.

The Asset Allocation column shows the Net Operating Income After Tax after proportionately distributing the Corporate/other costs back to the business segments. It also shows Net Assets by business segment after proportionately distributing Corporate/other assets and Current liabilities back to the business segments.

Appendix 5. West Fraser return on assets calculation for the years 2000 – 2004 and five-year average. Weldwood is not included because the purchase was not completed until December 31, 2004.

WEST FRASER	2004	2003	2002	2001	2000	Five Year Average	Asset Allocation
Net Operating Income After Tax							
Lumber	192	25	91	63	64	87	83
Panels	29	8	31	24	16	21	21
Pulp	(10)	(19)	21	31	76	20	19
Other	(26)	(8)	(6)	(5)	19	(5)	
Total	185	6	136	113	174	123	123
Identifiable Assets							
Lumber	842	808	812	807	711	796	802
Panels	209	230	246	258	274	243	245
Pulp	684	675	741	765	775	728	734
Other	405	374	317	490	694	456	
Current liabilities	-385	-496	-387	-478	-462	(442)	
Total	1755	1591	1729	1842	1992	1782	1782
Return on assets							
Lumber	22.8%	3.1%	11.2%	7.8%	9.0%	10.9%	10.4%
Panels	13.9%	3.6%	12.5%	9.1%	5.7%	8.8%	8.4%
Pulp	-1.4%	-2.9%	2.8%	4.1%	9.8%	2.7%	2.6%
Other	-6.4%	-2.2%	-1.9%	-1.0%	2.7%	-1.1%	
Total	10.6%	0.4%	7.9%	6.1%	8.7%	6.9%	6.9%
Operating Income							
Lumber	298	39	139	104	102		
Panels	45	13	47	39	25		
Pulp	(15)	(30)	32	52	122		
Other	(40)	(13)	(9)	(8)	30		
Total	288	9	209	187	279		
Tax rate	35.6%	35.7%	34.8%	39.7%	37.6%		

Corporate and other costs are comprised of corporate, head office and information technology costs. 2004 is unusually high due to the purchase of Weldwood. Corporate and other assets include long-term investments, deferred charges and other assets not directly related to a business segment.

The Asset Allocation column shows the Net Operating Income After Tax after proportionately distributing the Corporate/other costs back to the business segments. It also shows Net Assets by business segment after proportionately distributing Corporate/other assets and Current liabilities back to the business segments.