FOREST PRODUCTS INDUSTRY RISK BASED LENDING GUIDELINES

by

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ABSTRACT

Institutions within the Farm Credit System (FCS) make risk-based lending decisions. As a primary lender to agriculture, these decisions are based on qualitative and quantitative procedures based on guidelines created for the purpose of measuring financial risk or the future probability that a loan will be in default of full repayment. As the risk increases, the cost to the FCS institution also increases to support a higher risk, higher probability of delinquency. Concentration risk, intrinsic risk, transaction risk, repayment risk, reputation risk are just a few examples of risk-based lending decisions.

Under regulatory direction, FCS institutions have a charter to provide financing to agriculture's food and fiber industries. The forest products industry is a large commodity borrower of risk-based financing within the FCS, specifically in the Pacific Northwest. Among other commodities, Northwest Farm Credit Services (Northwest FCS) supports the forest products industry through financial lending products.

A majority of agricultural commodities reflect cycles of robust earnings and weak profits based on macro- and micro-economic indicators. The United States forest products industry had a period of strong earnings based primarily on the housing bubble between 2002-2007. With the U.S. economic recession beginning in 2008, the forest products industry also waned from 2008-2012. This impact resulted in financial stress for many forest product companies, both nationally and internationally. Due to the downturn in the forest products industry, regulators were quick to position the industry with high risk-based assumptions, thus putting pressure to Northwest FCS' risk-guidelines in supporting that historical analysis accurately depicted industry risk.

The purpose of this thesis is threefold: to study the correlation between different major commodity groups to better understand the value of a commodity concentration limit as a way to mitigate portfolio risk for Northwest FCS; to support analysis used by Northwest FCS and their ability to calculate the likelihood of financial stress; and provide customer-based feedback by way of a survey from forest products companies in the industry, as additional support to assumptions that were used to calculate certain subjective criteria for estimating risk.

As one method to analyze financial risk, customer data was collected for the years ending 12/31/2008, 12/31/2011, and 12/31/2014. Statistical regression analysis was used to measure financial stress migration based on companies in the forest products industry. The regression analysis indicates financial measures of liquidity, leverage, and cash flow used for such calculated stress, specifically prior to the economic downturn of 2008, through the downturn of 2008-2012, and post-recovery of the forest products industry are correlated with measuring financial risk.

As a risk mitigation tool, the board of directors that governs Northwest FCS hold a commodity concentration limit of fifteen percent (15%) for the forest products industry.

The customer survey provided information that allowed Northwest FCS to create subjective rating criteria for calculating risk. A guideline was created to assess subjective criteria provided by forest products customers on the same level based on the feedback provided which may be beneficial for understanding current results and potential future subjective risk associated within the industry.

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CHAPTER I: INTRODUCTION

"The FCS is a nationwide network of borrower-owned lending institutions and specialized service organizations. Congress established the FCS in 1916 to provide a reliable source of credit for the nation's farmers and ranchers. The Farm Credit mission is to help rural communities and agriculture grow and thrive by financing vital rural infrastructure and providing farmers and agribusiness with the capital they need to be successful. This focus on agriculture and rural America was the reason Farm Credit was established 100 years ago, to help fund America's food, fuel, and fiber" (Farm Credit System 2016).

Northwest FCS is a member of the FCS and is a cooperative lending and related services provider. Each Farm Credit institution has chartered territories within the United States. Northwest FCS' territory covers Alaska, Idaho, Montana, Oregon and Washington. Throughout these five northwest states, there is a tremendous amount of agricultural diversity. Northwest FCS also participates with key partners in the FCS to further diversify the commodity makeup of their portfolio allowing it to serve over two hundred industries. The FCS is regulated by the Farm Credit Administration (FCA) that sets guidelines and enforces policy set forth in similar fashion to Basel Accord principles. As such, Northwest FCS makes risk-based lending decisions according to these policies.

Northwest FCS employs a board policy limiting concentrations of major commodities within its portfolio. The policy states that "no single commodity will comprise greater than 25% of the total Northwest FCS loan portfolio, with the exception of loans in the fisheries (driven by a specific FCA policy) or forest products portfolios, which will not exceed 15% of the total portfolio" (Northwest FCS 2005).

As depicted in Figure 1.1, the forest products portfolio represents 12% of Northwest FCS' owned portfolio and is the largest single industry concentration. The dairy, tree fruit and nut, cattle and livestock, and potato industries will also be discussed throughout this thesis and make up the second, third, fourth, and fifth largest owned volume portfolio concentrations at 11.6%, 9.0%, 8.7%, and 7.3%, respectively (Northwest FCS 12-31-2015). As such, concern continues to be placed on the forest products industry in quantifying potential downside risk for Northwest FCS.

Figure 1.1 Portfolio by Top 5 Commodity Groups
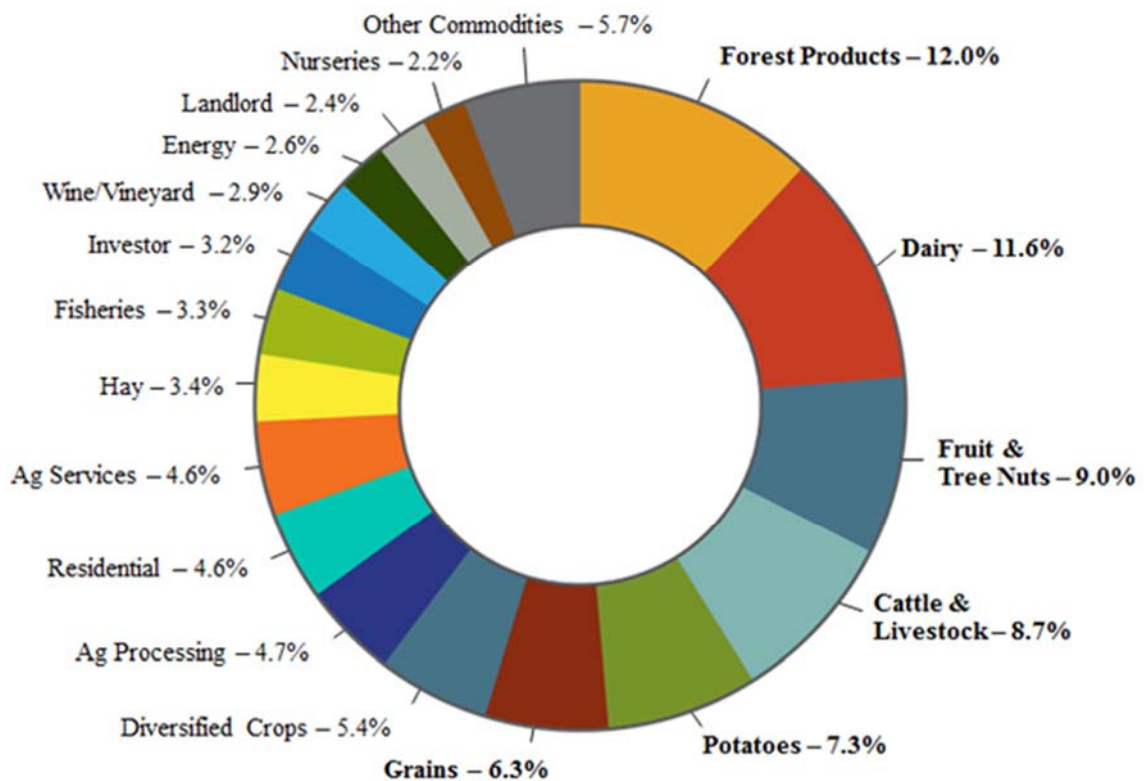
Since the forest products industry is the largest commodity concentration in the Northwest FCS portfolio, this thesis will discuss risk mediation techniques that

Northwest FCS has integrated to diversify risk in this industry. A commodity concentration limit of 15% is discussed to better assess whether this limit potentially decreases risk for Northwest FCS.

An additional objective of this thesis is to analyze customer data for the years ending 12/31/2008, 12/31/2011, and 12/31/2014 and review financial stress migration based on the forest products industry. This data represents a snapshot of financial risk associated with the forest products industry over a six year period. The sample uses regression analysis to analyze whether risk-based metrics selected by Northwest FCS are appropriately measuring risk in the forest products industry.

Risk equates to potential losses for Northwest FCS and accurately accounting for potential risk is key to the long term viability of the organization. This analysis allows for additional insight to the effectiveness of the historical methodology used in calculating risk-based lending decisions in the future.

CHAPTER II: LITERATURE REVIEW

2.1 Risk Applicability

There has been considerable research regarding risk-based lending practices and application throughout the world. Most of this research is centered on a broad based area of study. Little has been done specific to the forest products industry. A blend of research has been completed to individually critique risk associated to the forest products industry and also capture risk associated with lending. The literature review is broken into two parts, each reflecting the abovementioned area of study.

2.1.1 Risk in Forest Products

According to the USDA, total woodland in the contiguous U.S. decreased from approximately 680 million acres in 2007 to 620 million acres in 2012 (USDA 2012) with decreased private land ownership being the primary cause of the change. However, Li and Zhang analyzed the relationship of private timberland owners and the state of the forest products industry and concluded that private timberland ownership is becoming more difficult for long term financial success in the private sector (2014). These findings are based on the U.S. government's lack of timberland harvest of U.S. owned lands and the increased regulatory demand on firms. For example, GAAP undervalues timberland on a book basis because tree growth is not considered as an increase in asset value. This lowers the value of industrial (private) owners' assets, leaving them subject to potential buyouts (Li and Zhang 2014). While there seems to be finger-pointing between the public and private sector as to whom is at fault, there continues to be an ample supply of timber to offset a decreasing land percentage. This can be attributed to more efficient forest reproduction practices as well as a broader sense of sustainability (Li and Zhang 2014).

Similar to crop land ownership, there continues to be an ongoing push for large

corporate timberland owners vying to acquire small timberland properties. The Land Use

Policy states that Eastern U.S. private timberland ownership is the largest by count, when

compared to total U.S. timberland, but is diminishing faster than any other region

(Mondal 2012). It is noted that family succession plays a critical role in the transfer of

these assets as many of the younger generations want the cash rather than managing a

forest with little to no immediate return.

2.1.2 Risk-based Lending Research

Not much public research has been published for risk-based lending in the forest

products industry. This does not mean, however, that the industry has lacked appropriate

information to assess risk. On the contrary, significant improvement on assessing risk

based on a set of general guidelines has allowed for better analysis and comparison. The

Basel Accord principles initially adopted in the early-2000s were a turning point for

banks' ability to price to a generalized set of risk criteria.

Featherstone, Roessler, and Barry studied the probability of default and risk-rating

classification for certain Farm Credit System loans. Their research indicated that basic

financial standards assessed at the 7th Farm Credit District were repayment capacity,

solvency, liquidity, and collateral adequacy (Featherstone, Roessler and Barry 2006).

This research concluded that all of the variables were statistically significant in predicting

the loans that went into default. Commitment amount was not statistically significant in

predicting default. They suggested that further research should be done to look at the

migration of loans from one risk-rating class to another over time and to look also at the

incorporation of the loss given default component of the dual risk rating (Featherstone,

Roessler and Barry 2006).

An article by Escalante, et al. outlined general agricultural based assumptions. The article stated that "the success or failure of the farm business usually does not solely depend on the farm's ability to implement growth-enhancing and risk-reducing business plans. Certain macroeconomic forces, beyond the farm manager's control, could significantly affect the effectiveness of such business strategies" (2004). The financial factors used by Escalante, et al. in determining farm credit migration rates were solvency, financial efficiency, liquidity, and repayment capacity. The macroeconomic factors were the growth rate of farm real estate values, availability and cost of credit (calculated by average interest rates for agricultural mortgages), and general economic outlook of the investment community (calculated by S&P stock price index).

The results showed that while the farmer has control of the financial soundness of the operation, external factors can play a role in adverse lending conditions (Escalante, et al. 2004). While not all variables were statistically significant in the model, the study rendered the methodology of additional risk guidelines for agricultural products could be based on more than qualitative measures grasped from financial data.

Another article (Noland 2005) examined similar regulation requirement changes by the Northwest FCS in the early 2000s, and was able to evaluate risk-based lending measurements, the FCA regulatory requirements, and classification of a risk-return guideline. The findings concluded that "the risk-rating model represents a scheme for ranking borrowers' creditworthiness based on financial and non-financial indicators. Risk rating characteristic components include as primary measures: liquidity, leverage, and debt coverage. Secondary measures include: frequency of cash flow, quality of financial reporting, repayment performance, management, adherence to loan conditions, and

industry outlook" (Noland 2005). This viewpoint from another FCS association correlated similar financial benchmarking from Northwest FCS. Additionally, Farm Credit West and Northwest FCS operate in close geographic proximity to each other and, therefore, have similar industry risk-based portfolios.

Another article was completed in 2014 by Zollinger. His theory was that a correlation between the current risk assessment model could project a potential loan default anticipated one, three, or even five years in advance based on current default risk models (Zollinger 2014). His data included a large variety of agricultural commodities. The results from his study indicated that correlation does exist between historical and current risk based lending measures to project a potential default in the future (Zollinger 2014). This work has some merit to the forest products industry. While the correlation of future risk-assessed prediction models will not be examined, the ability to look back at the methodology in the forest products industry (past performance) and correlate if, in fact, that methodology was correct given today's environment. This study will assess the ability of whether past risk was calculated accurately by looking at how the industry is positioned today.

2.2 Survey Applicability

A survey was used by Birchmeier in 2005 to help quantify customer data in the Michigan greenhouse industry. Her survey was designed to capture information about customers in the areas of demographics, general farm operations, products sold, and ownership structure (Birchmeier 2005). The survey approach was beneficial and Birchmeier received a 45% response rate on the survey. She found that there was equal customer satisfaction knowing the lending institution was able to gather this information together on behalf of their customers to more fully understand the industry.

CHAPTER III: THEORY

3.1 Introduction

The Forest Products industry is different than other commodities served by Northwest FCS. For that reason, a specialized lending division focuses on originating and servicing all forest products loans and accounts. This division has worked to understand the drivers behind the industry. Due to its uniqueness, it is important to outline specific industry definitions that are associated with the empirical results of this thesis.

3.2 Financing the Industry Players

The forest products portfolio today is made up of three different segments of borrowers: tree farm operators, processors/manufacturers, and integrated operations. Each segment has different characteristics, needs, and risks.

Tree farm operations own the land and standing timber. There are two primary classes within this segment: family owned and investor owned. The family owned timberlands are held by private family investors. Investor owned timberlands are held by institutional investors such as Timber Investment Management Organizations (TIMOs) and Real Estate Investment Trusts (REITs).

Processors and manufacturers own conversion facilities used to turn logs into usable lumber and wood products. These operations do not typically own a significant timberland base. They are also known as saw mill operators.

Integrated operations own both timberland assets as well as conversion facilities. This business model has been used by family owned operations with significant timberland areas, typically with throughput of owned logs greater than 35%. It allows them to put their own logs through the mills and still purchase timber from other

operations to keep the conversion facility running at a capacity to be profitable (Northwest FCS 2015).

It is important to realize the differences in each of these borrower segments as each has a different risk appetite. This is reflected in the risk-based lending breakdown later in this chapter.

3.3 Key Definitions Specific to the Forest Products Industry

The following definitions are key to understanding the risk profile of each of the players in the forest products industry.

Log and lumber scale measurement: Most forest products measurements are based on the board foot which is defined as a board 12 inches wide by 12 inches long by 1 inch in thickness. This board foot measurement represents the predominate finished product of the region i.e., lumber. Due to the relative size of a board foot (bf), the reporting is normally in thousand board feet (mbf).

Sustainable Growth: Sustainable growth is defined as the growth that a forest can produce continuously at a given intensity of management (i.e., harvest). Timber is different than other natural resources that are depleted as the product is mined or harvested because the natural resource is a growing asset and does not have a finite supply when appropriately managed. Accordingly, sustained growth management implies continuous production to achieve a balance between growth (increment) and harvest at the earliest economical time.

Depletion: Depletion is an accounting practice used primarily for natural resource industries (e.g. oil, mineral deposits, thermal energy sources, gravel pits, and standing timber), that allows a company to account for the reduction of a product's reserves.

Depletion for a natural resource (measuring the timing difference between asset purchase and liquidation) is similar to depreciation for property, plant, and equipment (measuring the cost recovery allocation of the asset over its economic life). Depletion is considered by the investment community as an allowance for replacement of the asset (for income tax reporting) and as a primary source of repayment if the purchased asset is leveraged with debt (for cash flow available for repayment). Timber is a natural resource managed in a sustainable manner where growth may equal or even exceed depletion (Northwest FCS 2015).

As shown in Figure 3.1, the comparison represents long term impacts of the various depletion rates for a company and how the depreciation rate would approximate over an assumed 50-year rotation where the company harvested the sustainable yield each year and added no other timberlands to the operation.

The sustainiable yield, indicated by the green line, represents what should be harvested, on average, over the life of the asset. The method of financial reporting is either tract by tract (red line), which means you capture depletion in the year the tract is harvested, or average cost (blue line). Both methods end with the same total value; however, yearly depletion values can swing wildly. The financial impacts from depletion can vary based on the amount of timber harvested in a given year, which can dramatically affect the balance sheet and income position.

Figure 3.1 Depletion Rate Comparison
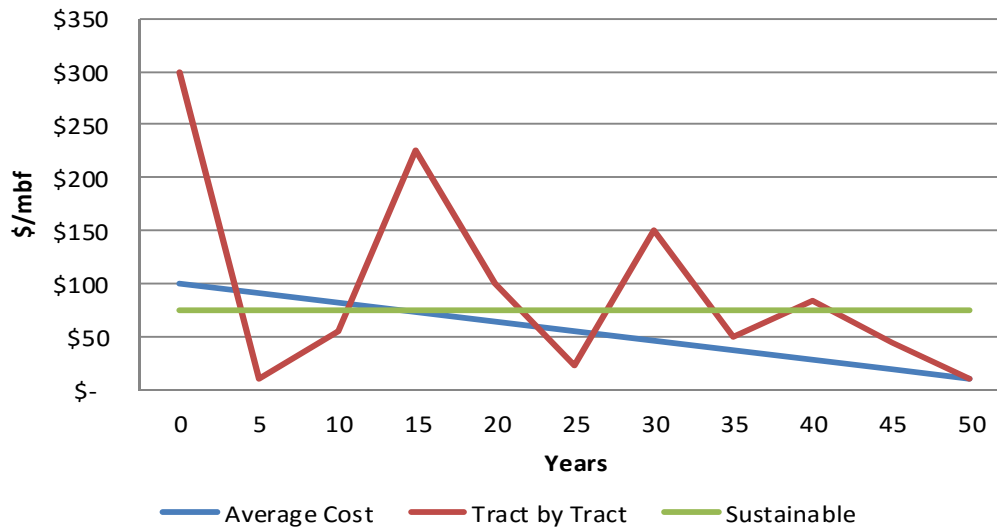
In summary, the financial statements for forest products companies are impacted by specific accounting rules to the industry that can impact the statement of income and balance sheet making it difficult to compare companies without making adjustments to GAAP reported data. Depletion and sustainable harvest are two key concepts in financing the forest products industry, as depletion is impacted by two material factors: the timing on when the timberlands were purchased and the type of depletion accounting used.

3.4 Risk Classification System

The FCS operates under a unified system for calculating risk. In the agricultural lending industry, the "building block for quantifying credit risk is Expected Loss (EL), the loss that can be expected from holding an asset" (Jouault and Featherstone 2011). The EL of any organization is typically determined on a short term horizon, occurring within the next 12 months. It further takes the approach of assessing risk methodology by combining both the Loss Given Default (LGD) and Probability of Default (PD).

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LGD is the assessment of potential loss assuming a loan goes into default. In layman's terms, LGD assesses the probability that Northwest FCS will be repaid by collecting against the existing collateral position if the loan defaults within the next 12 months. Northwest FCS has adopted a four letter default scale of B (well-secured), D (adequately-secured), E (marginally-secured) and F (under-secured), as depicted in table 3.1 (Northwest FCS updated 2015). The LGD is an important aspect of risk-based lending; however, it does not completely drive risk-based lending decisions.

Table 3.1 LGD Classification Guidelines

Loss Given Default	Real Property	Real Property and Chattel	Chattel only	Unsecured
B - Well Secured	<=65%	<=65%	<=55%	n/a
D - Adequately Secured	61-75%	61-75%	55-65%	n/a
E - Marginally Secured	76-85%	76-85%	66-75%	n/a
F - Under Secured	>=86%	>=86%	>=76%	All

PD is defined as the likelihood a customer will experience a loan default within a twelve-month time period. FCS organizations have adopted a 14-point PD-rating scale that aligns with the Uniform Classification System (UCS) employed by the Comptroller of the Currency, Federal Reserve, Federal Deposit Insurance Corporation and the FCS. UCS credit classifications are assigned based on risk and include the following five categories: Acceptable, Other Assets Especially Mentioned (OAEM), Substandard, Doubtful, and Loss (Farm Credit Administration 1994).

Table 3.2 outlines the UCS classifications and corresponding PD rating. PD ratings of one through nine are classified as acceptable with the following specifications: PD one to three are specific to loans with public debt ratings of A or better and rarely

used by Northwest FCS. All acceptable loan assets are of the highest quality and include

government-guaranteed loans. A PD rating of 10 is classified as OAEM of which OAEM

assets are still protected but are potentially weak, being criticized but not considered

adverse.

Adverse asset ratings are PD 11-14. A PD rating of 11 is classified as

Substandard-Accrual. A PD rating of 12 is classified Substandard-Nonaccrual.

Substandard loans are inadequately protected by the repayment capacity, equity, and/or

collateral pledged. They are characterized by the distinct possibility that the lender will

sustain some loss if the deficiencies are not corrected. A PD rating of 13 is classified as

Doubtful and portrays inherent weaknesses as classified Substandard with the added

characteristics that such weaknesses make collection or liquidation in full, on the basis of

currently existing facts, conditions, and values, highly questionable and improbable. The

final PD rating of 14 is classified as loss and considered uncollectible and that the asset is

of such little value that continuance as a bookable asset is not warranted (Northwest FCS

2005).

Table 3.2 UCS Classifications and PD Ratings

UCS Classification	PD Rating
Acceptable	4 - 9
OAEM	10
Substandard - Accrual	11
Substandard - Non-Accrual	12
Doubtful	13
Loss	14

It is important to note that the lower the PD rating, the stronger the company, and

the less probability that exists for default in the next 12 months. This concept is important

to note that calculating low levels of risk are directly correlated with a low PD rating,

unlike a liquidity measure (working capital, for example) that supports increasing numerical values as decreasing risk.

Various ratios are used to assess risk. The ratios used to calculate potential risk in the forest products industry are primarily standard ratios used in most businesses. As mentioned above, however, the industry does offer uniqueness in the calculated application using depletion and sustainable growth.

The risk-based profile of timberland owners differs from processors and integrated operations. Both use similar risk rating categories; however, the system of risk weighting is different. The following definitions pertain to the PD model and its ability to accurately measure risk based on model assumptions. Liquidity, leverage, and coverage calculations are used to support PD assessment in the forest products industry.

Liquidity. Liquidity is measured by the current ratio. This is calculated as current assets divided by current liabilities and correlates to the amount of liquid assets (assets turned to cash in less than one year) a company has on its balance sheet.

Leverage. Leverage is measured by a debt to market value asset ratio. This is calculated as total funded indebtedness divided by total assets. Assets are calculated at the lower of cost or market per GAAP and then internally adjusted based on market value of timberland in excess of book value to meet sustainable growth guidelines set by the forest products customer. This value is based on how much timber is expected to be harvested in the next year comparative to depletion in that year.

Coverage. Coverage is measured by a Debt Coverage Ratio (DCR). While industry norm financial guidelines calculate debt coverage using earnings before interest, taxes, depreciation, and amortization (EBITDA), the forest products industry standard

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calculation for this ratio is different because it includes depletion in the calculation. For forest products debt coverage ratio, this is calculated by dividing a three year adjusted average of Earnings Before Interest, Taxes, Depreciation, Depletion, and Amortization (EBITDDA) (two historical years plus a projection) by projected annual debt service (principal and interest). Adjusted EBITDDA includes the impacts of balance sheet management and consideration given to the materiality of the sales and company's impact to future operational cash flow (Northwest FCS updated 2015). Adjusted EBITDDA deducts income taxes and distributions to compare true cash earnings available to cover yearly obligations.

The PD model thresholds are weighted to allow for appropriate measurements of risk associated with overall risk guidelines (Table 3.3 and Table 3.4). Both models use a function of liquidity, leverage, and coverage as a numerical basis for risk.

Table 3.3 Probability of Default Model – Timberland

	3 Yr Avg. DCR (35%)	D/A Ratio (30%)	Current Ratio (15%)	Management (15%)	Industry (5%)
4	≥ 2.50	$\leq 25\%$	≥ 2.50	Subjective Rating determined by account team	Subjective Rating established by Credit Approval Committee
5	≥ 2.00	$\leq 30\%$	≥ 2.00		
6	≥ 1.75	$\leq 35\%$	≥ 1.75		
7	≥ 1.50	$\leq 40\%$	≥ 1.50		
8	≥ 1.25	$\leq 45\%$	≥ 1.25		
9	≥ 1.10	$\leq 50\%$	≥ 1.10		
10	≥ 1.00	$\leq 55\%$	≥ 1.00		
11	≥ 0.90	$\leq 60\%$	≥ 0.90		
12	< 0.90	$> 60\%$	< 0.90		

Table 3.4 Probability of Default Model – Processor or Vertically Integrated

	3 Yr Avg. DCR (25%)	D/A Ratio (15%)	Current Ratio (25%)	FD / EBITDA (15%)	Management (15%)	Industry (5%)
4	≥ 2.50	≤ 35%	≥ 2.50	≤ 2.00	Subjective Rating determined by account team	Subjective Rating established by Credit Approval Committee
5	≥ 2.00	≤ 40%	≥ 2.00	≤ 2.50		
6	≥ 1.75	≤ 45%	≥ 1.75	≤ 3.00		
7	≥ 1.50	≤ 50%	≥ 1.50	≤ 3.50		
8	≥ 1.25	≤ 55%	≥ 1.25	≤ 4.00		
9	≥ 1.10	≤ 60%	≥ 1.10	≤ 4.50		
10	≥ 1.00	≤ 65%	≥ 1.00	≤ 5.50		
11	≥ 0.90	≤ 70%	≥ 0.90	≤ 6.00		
12	< 0.90	> 70%	< 0.90	> 6.00		

Based on the components that make up the PD for each model, each risk-based category within the model is given a score between 4 and 12 based on established ratio thresholds, and then a weighting is applied to arrive at a weighted average for the overall PD rating.

As noted, the PD models demonstrate qualitative and subjective criteria for assessing risk. Approximately 20% of the overall risk-based lending guideline is based on subjective information represented by the Management and Industry categories.

The *Management* rating can be better explained by subjective criteria such as financial management skills, timberland management skills, processing management skills, marketing management skills, and wood basket positioning. While a 'rule of thumb' may exist in the classification of Management in the PD model, a survey was provided to all forest products customers to better assess the subjectivity to the PD model. The survey provided support to the subjectivity of the PD model and will allow for a more concrete methodology for scoring such subjective criteria.

3.5 Additional Risk Based Lending Strategies

In addition to the ability to calculate risk through LGD and PD, additional internal risk-based guidelines are used to measure the overall risk profile of a customer and industry. Additional risk-based guidelines used in the forest products industry to support risk decisions calculate concentration risk. Concentration risk is defined as the risk associated to Northwest FCS based on total loan commitments to a single industry in comparison to the overall loan portfolio. Concentration, or in other words, having too much volume in one commodity, could increase risk for Northwest FCS in the event that the industry experienced prolonged financial difficulty (Northwest FCS updated 2015).

Concentration risk focuses on a specific industry, like forest products, and compares that to all other industries. The calculations are based on internal guidelines allowing Northwest FCS to manage risk in economic downturns. Comparing a high level risk structure to other commodities that Northwest FCS finances allows for synergies to be made within specific commodity groups which minimizes risk across multiple commodities.

CHAPTER IV: METHODS

4.1 Introduction

The methods used in gathering and analyzing data are regression analysis, customer surveys, and additional risk-based tools. The forest products data provide a basis for calculating and subsequently making risk-based lending decisions.

4.2 Data

The data used in this model are derived from an internal of financial measures at Northwest FCS. All data is based on a fiscal year end (FYE) financial statement that does not always mean a calendar year end statement. The data set is classified as a 12/31/XX statement in the system, even though some year-end statements may be prior to or past that date. A majority of forest product companies use a calendar year end for their FYE. Whether or not the actual FYE is at calendar year end does not impact the data. The important factor is that it is the same date in subsequent 3-year periods.

FYE financial statements were taken as a snapshot in 2008, 2011, and 2014. This provides a window to examine the results of the economic downturn and if, in fact, the PD model was able to measure the probability that a company would default on their loan within a 12 month time period. A total of 45 forest products companies were used in the study as each of these had three sample years. Companies outside the Pacific Northwest were not included in the study.

Of the 45 in the sample, 24 were either a processor or integrated operation, and 21 were timberland owners. While the PD is similar between the two types, the regression model was estimated separately for each industry. With the downturn, timberland owners decision making was much different than those of a processor or integrated operation.

4.3 Regression Model Design

Regression analysis is "A statistical technique that attempts to explain movements in one variable as a function of movements in a set of other variables through the quantification of a single equation" (A. Studenmund 2001). In other words, regression modeling attempts to explain how differing movements in independent variables impact a single dependent variable. Regression analysis examines correlation between variables based on generalized assumptions, allowing specific analysis to occur on multiple variables while independently reflecting the correlation to that variable.

OLS regression model was used as an estimation technique. The linear regression uses the following as a baseline equation:

$$Y = f(X_1, X_2, X_3, \ldots X_n) \tag{1}$$

where Y is the dependent variable and X's are the independent variables.

Two equations are used in this model to capture timberland owners and processor/integrated operations:

$$PD_T = B_0 + B_1CR + B_2DCR + B_3D/A + e_i \tag{2}$$

and

$$PD_{P/I} = B_0 + B_1CR + B_2DCR + B_3D/A + B_4FDE + e_i, \tag{3}$$

where PD_T is the Probability of Default for timberland owner, $PD_{P/I}$ is the Probability of Default for processor/integrated operation, B_0 is the intercept; CR is the Current Ratio; DCR is the Debt Coverage Ratio; D/A is the Debt to Asset Ratio; FDE is the Funded Debt to EBITDDA ratio; and e_i is the error term.

The current ratio (CR), a financial measure of liquidity, is expected to have a negative relationship with the PD strength. As the liquidity of a company improves, the

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PD will fall, ceteris paribus. The negative relationship is examined to measure how liquidity (ratio becoming larger) correlates with the PD (rating becoming smaller or closer to zero).

The debt coverage ratio (DCR), a financial measure of cash flow coverage, is expected to have a negative relationship with PD rating. As the ratio of required debt payments compared to earnings available to service debt increases, the less protected the operation is from default. Thus, an increase in DCR is expected to increase the PD rating, ceteris paribus.

The debt to asset ratio (D/A), a financial measure of leverage and/or solvency, is expected to have a positive relationship with PD rating. As the total liabilities of a business decrease in proportion to total assets, the risk of default also decreases and is correlated with a reduction in PD rating, ceteris paribus.

The funded debt/EBITDDA, a financial measure of balance sheet interest bearing liabilities to income capacity, is expected to have a positive relationship with the PD rating. As this ratio gets higher, it represents a greater deficit between total debt and the earnings available to service it. Thus, a higher ratio would put upward pressure on risk and the PD would increase, ceteris paribus.

The model is estimated to determine whether the dependent variables individually have statistical significance on the independent variable, leaving all else constant.

4.4 Survey Design

Similar to the survey template used by Birchmeier in 2005 to quantify customer data in the Michigan greenhouse industry, the forest products survey was designed to

capture information about customers in the forest products industry. Some of the variables include demographics, ownership/labor, and general operations.

The demographics section of the survey captures location of operation, primary wood basket, and type of operation. The ownership/labor section questions ownership make-up and labor intensity. The general operations section discusses questions based on a breakdown of sales commodity types, strength of financial reporting, and micro/macro-economic risks associated with the business.

The survey was created to gauge the information on non-quantitative data otherwise found in the financial statements. This data is intended to support the subjectivity measures of the PD model.

The survey was voluntary and did not impact the current customer relationship with Northwest FCS. All information gathered remains strictly confidential and only a summary of the data is reported.

4.5 Additional Risk Based Lending Strategies

Concentration risk is measured against the other top five commodities in the Northwest FCS portfolio. The idea that risk increases when you have "all your eggs in one basket" goes without saying. A high percentage of overall loan volume tied to a single account or a single agricultural industry will result in increased risk. The results are supported by internal analytical criteria.

CHAPTER V: RESULTS

5.1 PD Model Regression Analysis Results

A summary of the total observed data are in table 5.1. The survey consisted of data from 45 customers over the three year period of 2008, 2011, and 2014. This resulted in a sample of 135 observations. The mean probability of default is 7.58. While fluctuations in PD occur due to market cyclicality, the goal of Northwest FCS is to maintain a PD rating of 6-7 across the organization.

Table 5.1 Summary Data of all 135 Forestry Observations

Ratio	Mean	Standard Deviation	Min	Max
Probability of Default Rating	7.58	1.58	4.00	11.00
Current Ratio	2.73	2.19	0.33	12.73
Debt to Asset Ratio	0.47	0.32	0.06	3.41
Debt Coverage Ratio	1.32	0.63	0.11	4.40
Funded Debt to EBITDDA	5.41	4.97	0.15	26.46

To examine the trend in PD, the data is reported by year in table 5.2. Noteworthy trends are that the average PD rating increased from 7.69 to 8.56 between 2008 and 2011, which correlates to a forest products downturn. The average PD fell between 2011 and 2014 ending at 6.49. The other financial ratio trends also show a decline into 2011 with strengthened financial performance in the year ending 2014. It is important to note that the debt coverage ratio and funded debt to EBITDDA ratio are a 3-year weighted average of earnings, typically two historical years and one projected. This may affect some of the financial analysis results; however, the purpose of seeing whether these ratios are statistically significant in regression analysis warrants that they are used as they are in the PD calculation.

Table 5.2 Average Probability of Default Ratings, Standard Deviation, and PD Ratios by Year

Year	2008	2011	2014
Average PD Rating	7.69	8.56	6.49
Standard Deviation	1.19	1.33	1.47
Average Current Ratio	2.42	2.37	3.39
Average Debt to Asset Ratio	0.48	0.49	0.46
Average Debt Coverage Ratio	1.16	0.97	1.83
Average Funded Debt to EBITDDA Ratio	7.70	5.77	2.76

Two regression analyses were performed on the data collected. The PD models differ slightly between timberland and processor/integrated operations (equations 2 and 3).

5.2 PD Model Regression Analysis Results for Timberland

Table 5.3 reports the regression analysis on the data for timberland operations. The focus on this analysis was to determine if the independent variables (current ratio, debt to asset ratio, and debt coverage ratio) were statistically significant to the dependent variable (PD).

The results suggest there is a positive correlation with the debt to asset ratio and negative correlations with the current ratio and the debt coverage ratio (Table 5.3). For a one unit increase in the current ratio, there is an expected 0.017 PD decrease (improvement) in the PD model, ceteris paribus. For a one unit increase in the debt to asset ratio, there is a 3.722 PD increase (decline) in the PD model, ceteris paribus. For a one unit increase in the debt coverage ratio, there is a 1.239 PD decrease (improvement) in the PD model, ceteris paribus.

Table 5.3 Timberland Regression Results

Variable	Coefficients	Standard Error	t-Stat	P-value	Elasticity
Intercept	7.659	0.467	16.404	0.000	
CR	-0.017	0.022	-0.751	0.456	-0.008
DA	3.722	0.646	5.766	0.000	0.212
DCR	-1.239	0.189	-6.552	0.000	-0.220
R-Square	0.684				
Adjusted R-Square	0.668				
F - stat	42.599				
Significance F	0.000				

The analysis found that the adjusted R-squared indicates that over 66% of the variability in the PD model can be explained by the independent variables. The DA and DCR variables are statistically significant. The only variable that was not statistically significant was the current ratio with a corresponding p-value of .46. If you test at a 90% level of significance, the current ratio was not statistically significant. The elasiticty was calculated for each variable showing each variable is inelastic. The DCR is the most elastici at -0.220. The independent variable coefficient signs for the regression analysis are as expected.

5.3 PD Model Regression Analysis Results for Processor/Integrated Operations

Table 5.4 reports the regression analysis on the data for processor/integrated operations. The focus on this analysis was to see if the independent variables (current ratio, debt to asset ratio, debt coverage ratio, and funded debt to EBITDDA ratio) were statistically significant to the dependent variable (PD).

The results indicate there is a positive correlation with the debt to asset ratio and funded debt to EBITDDA ratio and negative correlations with the current ratio and the debt coverage ratio, similar to the timberland result. For a one unit increase in the current ratio, there is a 0.117 PD decrease (improvement) in the PD model, ceteris paribus. For a

one unit increase in the debt to asset ratio, there is a 1.197 PD increase (decline) in the

PD model, ceteris paribus. For a one unit increase in the debt coverage ratio, there is a

1.497 PD decrease (improvement) in the PD model, ceteris paribus. For a one unit

increase in the funded debt to EBITDDA ratio, there is a 0.039 increase (decline) in the

PD model, ceteris paribus.

Table 5.4 Processor/Integrated Operations Regression Results

Variable	Coefficients	Standard Error	t-Stat	P-value	Elasticity
Intercept	9.049	0.422	21.454	0.000	
CR	-0.117	0.039	-3.021	0.004	-0.042
DA	1.197	0.270	4.428	0.000	0.081
DCR	-1.497	0.204	-7.348	0.000	-0.255
FDE	0.039	0.025	1.592	0.116	0.003
R-Square	0.732				
Adjusted R-Square	0.716				
F - stat	45.801				
Significance F	0.000				

The analysis found that the adjusted R-squared indicates that approximately

71.6% of the variability in the PD model can be explained by the independent variables.

With the exception of the funded debt to EBITDDA ratio, all the independent variables

were statistically significant at the 10% level. The elasiticty was calculated for each

variable showing each variable is inelastic. The DCR was the most elastic at -0.255. The

independent variable coefficient signs are as expected based on the regression results.

Both the debt coverage ratio and funded debt to EBITDDA ratio use a form of

cash flow to measure repayment capacity. As a result, there is potential for multi-

collinearity between these ratios. To examine this, a simple correlation was calculated

and the results are in table 5.5.

Table 5.5 Correlation of Independent Variable Regression

	CR	DA	DCR	FDE
CR	1			
DA	-12%	1		
DCR	17%	-15%	1	
FDE	-11%	8%	-55%	1

Most of the variables reflect relatively small correlations, except the DCR / FDE relationship. At 55%, there could be the potential of multi-collinearity in the processor/integrated model. The timberland PD does not demonstrate this potential problem simply because the Funded Debt to EBITDDA ratio is excluded from the PD model. Multi-collinearity could be present in the findings.

While the potential of multi-collinearity exists, it does not mean that the sample data or independent variables are invalid. Options to remedy multi-collinearity are to do nothing, drop a redundant variable, or calculate the inverse of the variable, in this case funded debt to EBITDDA, in the regression analysis. There is no right answer to eliminate multi-collinearity since changing the sample may or may not provide substance to the model and potentially eliminate the chance for multi-collinearity (A. H. Studenmund 2011). Table 5.6 reports the regression analysis on the data for processor/integrated operations eliminating the FDE ratio, as a potential redundant variable, to test for multi-collinearity.

Table 5.6 Processor/Integrated Operations Regression Excluding FDE Results

Variable	Coefficients	Standard Error	t-Stat	P-value	Elasticity
Intercept	9.502	0.315	30.164	0.000	
CR	-0.118	0.039	-2.993	0.004	-0.043
DA	1.167	0.273	4.279	0.000	0.079
DCR	-1.670	0.174	-9.605	0.000	-0.285

R-Square	0.722
Adjusted R-Square	0.710
F - stat	58.895
Significance F	0.000

The analysis found that removing the FDE variable from the regression analysis had minimal impact to the R-square and variable intercept coefficients. The f-statistic increased slightly on the DCR ratio. The elasticisties show little difference compared to the original model.

5.4 Survey Results

As discussed earlier, the PD model has subjective components that make up a portion of the risk profile percentage. While these subjective figures are not captured in the regression analysis, the following section examines a new methodology for quantitatively assessing the subjective portion of risk.

While 45 forest products customers were used in the PD regression analysis study, the survey was sent to 72 forest products customers. Limiting the survey to only the 45 in the study, and using a previous thoughts that approximately 50% would respond, would result in fewer responses than desired. Widening that scope allowed for more responses from a larger geographic area of the Pacific Northwest. Of the 72 surveys sent, there were 38 respondents, a 53% response rate.

The most important result from the survey was the ability for Northwest FCS industry staff to meet to discuss the subjective material presented in the responses and

how that impacts potential risk in the industry. The overall findings of this survey created a baseline qualitative risk assessment specific to the forest products industry. While this continues to be an ongoing process, the subjective nature of the PD model has made incremental improvements on its assessment of customer risk.

Not all the information from the survey is used as subjective material to calculate risk. This survey was also intended to capture information to better serve the forest products industry. Building relationships and understanding the business is key for long-term success in the lending industry.

Some of the key findings in this survey are reported in table 5.6. Based on the respondents, the average company has been in business 57 years. The oldest is 127 years old (started business in 1889), and the youngest started 8 years ago. Vertically integrated companies constitute 58% of the sample, of which 79% of those are either Tier 1 or Tier 2 operations. This result is promising for the industry (and for Northwest FCS) as it demonstrates continuous technology improvements in the industry which, in turn, depicts the quality of those receiving financing from Northwest FCS.

Approximately 92% of respondents are either a C- or S-Corporation. All respondents have accountant prepared financial statements, with 97% providing something other than a compiled financial statements. Given the financial capital of this industry, these results demonstrate that most are positioned to receive financial information annually.

Table 5.7 Overview of Survey Results

	Responses	% of total		Responses	% of total
Average Age of Operation	57 years	n/a	Sales Break Down (average)		
Business Classification			Wholesale	n/a	39%
Timberland	15	39%	Retail	n/a	61%
Processor	1	3%	Export	n/a	30%
Vertically Integrated	22	58%	Domestic	n/a	70%
Proccessing Facility Tier			Financial Statement Quality		
Tier 1	10	45%	Unqual'd Audit	8	21%
Tier 2	8	36%	Qual'd Audit	16	42%
Tier 3	3	14%	Reviewed Audit	13	34%
Tier 4	1	5%	Compiled Audit	1	3%
Ownership Structure			Internal Prep'd	0	0%
LLC	3	8%			
C-Corp	10	26%			
S-Corp	25	66%			

From a sales breakdown, approximately 39% of sales in the forest products industry are wholesale with 61% being retail. The survey also found that 30% of sales are exports and 70% remain in the U.S. These results are affected by the strength of the U.S. dollar compared to other foreign goods and the ability for companies outside the U.S., like Canada, to pressure U.S. based companies.

Responses for industry factors that impact forest products are reported in table 5.7. Based on a result being either 'important' or 'very important', of the 11 impacts from the question, market demand (100%), competition (100%), and environmental regulations (100%) were most important. Based on a result being either 'very minor' or 'minor', the least important were water supply (42%), own managerial expertise (22%), and weather (11%).

Because this is a commodity driven market for both log sales and lumber sales, the results demonstrate that forest products companies rely on strong market demand and competition to be successful. As noted in the most recent downturn, many of these companies struggled financially with most in the industry curtailing hours and shutting

down mills and log yards. Those who weathered the storm reaped the benefit of increased market demand after the economic recovery.

Environmental regulations as one of the most important factors was somewhat surprising. Global innovation continues to result in additional regulatory guidelines. Even though the forest products industry is not a food commodity, it provides the necessary fiber for many food products. Regulators argue for the need for transparency in global food demand. Forest products companies continue to react to these changes. Other regulations impacting timberland owners include the preservation of endangered species and political issues regarding long-term sustainability of forestry practices. Like many other commodities, it has become increasingly difficult to do business as regulations limit future growth opportunities.

From the responses, it is interesting to note that water and weather are not as critical to forest products as they are for other more traditional agricultural based commodities. One reason why this may be true is that trees are planted in areas that receive water (either rainfall or snowpack) and not much impact comes from weather other than wildfire. Even in a drought year and being more susceptible to fire, the trees still grow which is why the industry is able to absorb risk better than some other commodities.

A company having its own managerial experience rates within the least important factors was an interesting response. Eight of the surveyed companies felt that having their own managerial experience impacted the industry the least. Similar to other industries, it would be a strong assumption that the forest products industry would be impacted with the amount of potential retirees in the coming years. Companies need experience to

remain financially sound during employee transition/retirement as well as to retain a strong reputation in the industry.

One way to view the results is that there may be the ability for a forest products company to easily bring in managerial expertise from other companies that provide experience rather than grow it internally.

Table 5.8 Survey Results on Rating Industry Impacts

Driver	Very Minor		Minor		Neutral		Important		Very Important		Total
	n	%	n	%	n	%	n	%	n	%	
Weather	0	0%	4	11%	4	11%	18	47%	12	32%	38
Land	0	0%	1	3%	6	16%	9	24%	22	58%	38
Market Demand	0	0%	0	0%	0	0%	15	39%	23	61%	38
Labor	1	3%	1	3%	0	0%	18	47%	18	47%	38
Water Supply	13	34%	3	8%	12	32%	5	13%	5	13%	38
Capital	0	0%	1	3%	9	24%	15	39%	13	34%	38
Competition	0	0%	0	0%	0	0%	10	26%	28	74%	38
Environmental Regulations	0	0%	0	0%	0	0%	25	66%	13	34%	38
Other Gov't Regulations	0	0%	3	8%	3	8%	16	42%	16	42%	38
Employee Turnover	0	0%	3	8%	4	11%	20	53%	11	29%	38
Own Managerial Expertise	4	11%	4	11%	15	39%	12	32%	3	8%	38

n= number of respondents, % = percent of total observations

Other results from the survey suggest that nearly 35% of the forest product companies own timberland or operate a sawmill outside the Pacific Northwest. One third of the companies may not impact the industry, but this trend can be attributed to large companies continuing to get larger to remain viable in the industry. Like other industries, the forest products industry has experienced a level of company consolidation.

5.5 Additional Risk Based Lending Strategy Results

To understand the current risk guidelines for commodity concentration risk, it is important to understand what the forest products industry has endured since the rise in U.S. housing demand during the early 2000s and how this industry compares to other top loan volume commodities.

During the 2008 through 2012 downturn, many companies had negative profits for multiple years. There were many differences with the most recent down turn compared to prior ones in the industry. The major differences were how the industry was positioned entering this down turn, the flexibility of Northwest FCS, the sophistication of the customer management teams, and the tax benefits of owning timber land as an investment (FCS 2014). Driven mostly by those four factors, Northwest FCS suffered no losses in the forest products portfolio through the worst industry downturn since the Great Depression.

Credit quality did decline during the recent recession, from 99.8% acceptable in 2007 to a low of 62.3% acceptable at year-end 2011. Substandard or doubtful volume only reached 7.8% at the end of the third quarter of 2011. The progressive management and strong balance sheets kept many customers in OAEM status, not reaching substandard or default situations. Such deterioration in credit quality without a large number moving to substandard or doubtful is a key difference from other commodities that have experienced stressed times.

When compared to the other top five commodities in the Northwest FCS loan portfolio, the dairy, cattle and livestock, tree fruit and nut, and potato industries did not suffer as large a decline in acceptable volume. The dairy, cattle and livestock, and potato industries, however, saw substandard or doubtful loan volumes reach equal or higher

levels when compared to the forest products industry and all three suffered loan losses during this time. This is noteworthy for the forest products industry when comparing risk among the top five portfolio concentrations because forest product companies were able to avoid loan loss while three other industries with large portfolio concentration sustained loan loss.

The forest products industry as of year-end 2014 was: 95.5% Acceptable, 3% OAEM, and 1.5% Substandard or Doubtful (FCS 2014). Figure 5.1 depicts the trends over an eight quarter period beginning January 2013 to December 2014. As with any industry, market cyclicality has caused stress to the Northwest FCS lending portfolio.

Figure 5.1 Forest Products – Credit Quality for 2013 and 2014
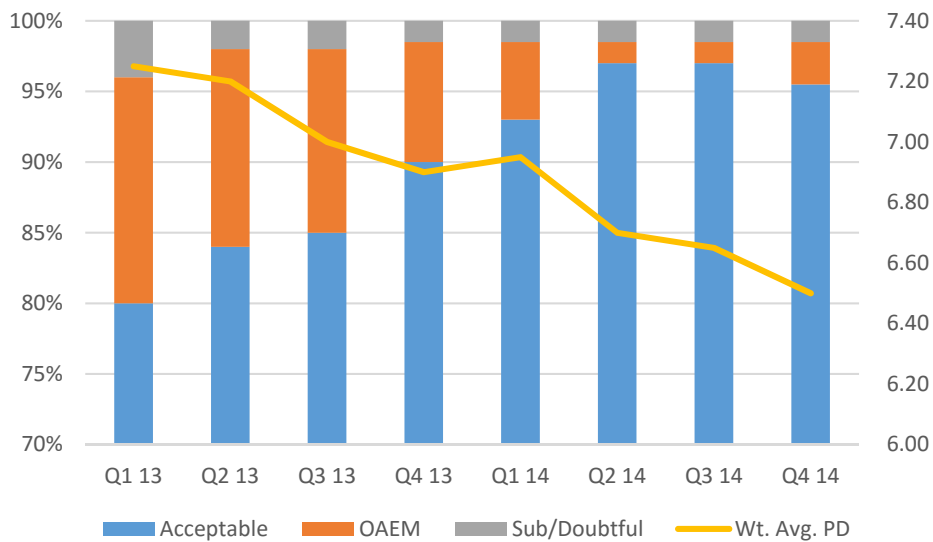
Another characteristic of the forest products portfolio that differentiates itself from other commodities is the average customer size (Figure 5.2). It could be argued that this differentiation justifies the continued commodity concentration limit of 15%. Of all

the commodities Northwest FCS serves, the forest products industry has the largest

average customer liability in the portfolio (Figure 5.3).

Figure 5.2 Customer Count by Commodity – 12-31-2014
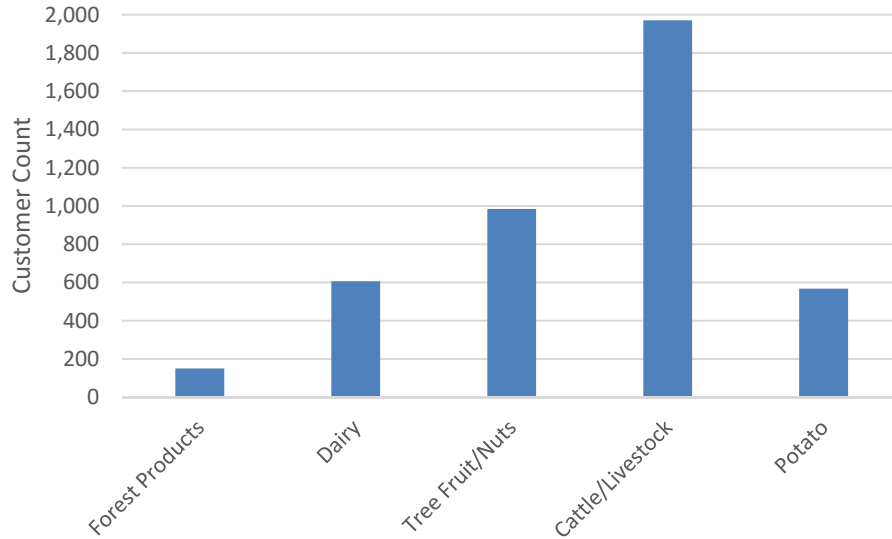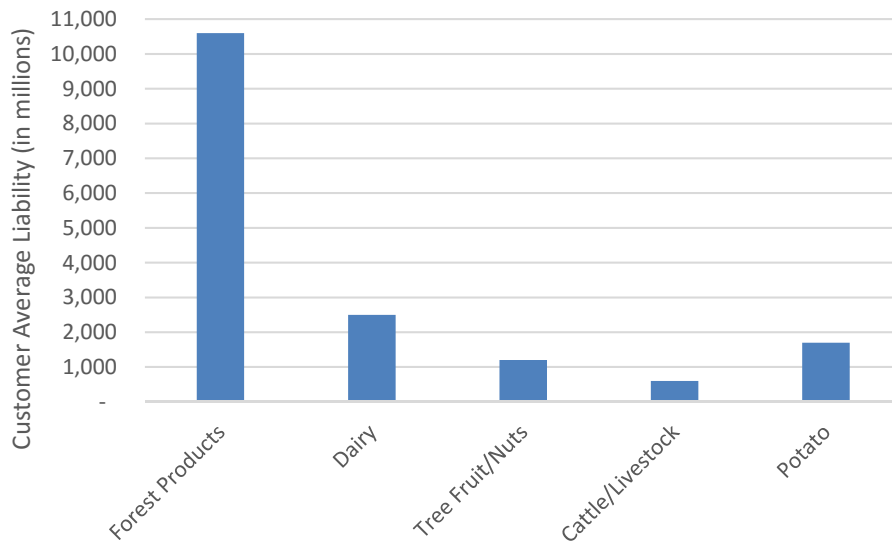

Figure 5.3 Customer Average Liability (in millions) – 12-31-2014

With only 151 customers holding $1.60 billion in loan volume and commitment as of 12-

31-14, this exceeds the average size of the portfolio for other commodities.

Having a smaller number of larger customers increases the perceived concentration risk in the portfolio, potentially suggesting a lower level of commodity concentration. There is merit due to the large number of losses that could be realized if a few customers were to fail. For instance, if the five largest customers in the forest products portfolio were to become classified as substandard loans, this would represent $222.55 million of volume or 2.3% of the total Northwest FCS loan portfolio. The next largest borrower concentrations by commodity are dairy and cattle industries. If the five largest customers in either of those portfolios were to fall to Substandard, it would represent approximately $120 million of volume and 1.2% of the total Northwest FCS loan portfolio. It is concerning that the top five customers in the forest products portfolio have almost twice the influence as the other largest top five concentrations. Hence the reason that this sector is perceived to have sufficient elevated risk to limit forest products concentration in the entire portfolio to 15%.

In both good times and stressed times, management has an impact on the credit quality of the portfolio. This is why a portfolio borrower concentration limit (hold limit) has been implemented, not only at Northwest FCS, but at virtually every FCS institution. It is also why risk associated with specific customer performance and that customers' impact on the overall portfolio should be managed through limits on the amount that a specific customer can borrow, not by limiting the amount of loans to the industry in which that customer operates, but through participations. Although there is a logical argument around a higher concentration of customers within the forest products portfolio causing increased credit risk to Northwest FCS, it is, at least at this point in Northwest FCS credit quality history, unfounded.

To mitigate against the risk of a few large customers potentially deteriorating loan classification within the industry, internal policies and controls should be considered, including the level of internal due diligence.

The level of due diligence and customer understanding for the few customers in the forest products portfolio is elevated from other industries. Because of the larger impact of one forest products customer's demise on the overall portfolio, it is imperative that each customer relationship be managed by a team of individuals that are knowledgeable not only about the customer, but also the industry. Northwest FCS has recognized this in not only the forest products industry, but many specialized industries by implementing teams with specific responsibilities to those industries. In addition to knowledgeable relationship teams, in areas where loan volume concentration with one customer increases, the number of individuals reviewing and approving credit increases. This issue has been addressed through Northwest FCS' delegated authorities platform that requires a higher level of review as a customers' loan volume with the association increases.

The concentration risk calculator is an internal tool that provides general guidelines used by Northwest FCS as an additional risk tool associated with the level of loan volume attributed to any one commodity or individual. These risk parameters are calculated every few years by the Northwest FCS risk management department. Based on internal calculations, the forest products industry is considered 'moderate' risk to the association as of 12/31/13. The calculated 'moderate' risk means there is potential of portfolio concentration risk and should be assessed to monitor risk over the long term.

While this internal control may not be widely used with other financial institutions, it allows for Northwest FCS to assess risk benchmarks based on potential concentration risk. This has been implemented as an additional risk-based lending guide to help mitigate potential future portfolio concentration risk and to validate that risk levels remain acceptable.

The concentration risk calculator, increased internal controls, additional due diligence on the forest products industry, and the board-approved concentration limit of 15% (versus industry wide 25%), all contribute to managing portfolio risk.

CHAPTER VI: CONCLUSION

6.1 Overview

Northwest FCS provides capital to the forest products industry in the Pacific Northwest. This research was completed to provide Northwest FCS tools to monitor and assess risk. This thesis also captured customer feedback to provide meaningful information to the industry.

Minimal public research has been completed to assess risk-based lending guidelines specific to the forest products industry. Northwest FCS has adopted various methods to calculate risk, based primarily on the financial performance of forest product companies.

Prior to this study, subjective criteria used in calculating potential risk was not determined in a structured form. A survey was sent to forest products customers of Northwest FCS to gain insight and assess subjective measures of risk. The results allowed for internal analysis that paved a way for a general set of guidelines to 'calculate' subjective criteria. This study was instrumental in that process and has, perhaps, provided the greatest result from the findings.

Given the additional pressure to model risk associated with the forest products industry, a regression analysis suggests the financial measures used to calculate risk are correlated with the PD measure. This was determined based on customer information prior to the economic downturn of 2008, through the downturn of 2008-2012, and post-recovery of the forest products industry.

Current guidelines allow Northwest FCS to review portfolio concentration risk and examine performance through the forest products downturn. Compared to the other largest commodity concentrations, the forest products portfolio had no losses through the

downturn and improved during the recovery, based on PD calculations. The limit on

portfolio concentration of 15% compared to 25% for most other commodities in the

Northwest FCS portfolio likely helped.

6.2 Research Limitations

The PD calculation contributes a weighted average score for all categories in the

model that may be limited based on the regression analysis. These weightings are

determined by a credit underwriting committee from Northwest FCS based on how

strongly each category has influence on the overall risk of the portfolio. Internal system

controls do not allow for extrapolation to normalize specific data for individual risk

calculations. This could affect the PD model regression results.

Because the loan size for each forest products customer is large compared to most

other industries on average, many forest product companies are publically traded. This

limits the number of forest products customers that Northwest FCS finances due to size

and geographic location and impacts the customer count in the study. Most of the

publicly traded accounts used in the analysis do not have a strong relationship with

Northwest FCS and therefore were not surveyed.

Although the survey response rate was over 50%, time was limited for additional

follow-up. Had there been additional time, a more formal process could have taken place

to obtain more survey responses.

6.3 Future Research

A study which encompassed the entire U.S. would provide additional data for

potential risk based assessments for the forest products industry. Many financial

institutions throughout the U.S. may not have interest in this study due to its specific

focus. Most of the data used focuses on U.S. timberland and sawmill companies located

in the Pacific Northwest. This study excludes a majority of U.S. timberland and sawmill

areas of the Northeast, East, and South.

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