MOODY'S ANALYTICS

MODELING METHODOLOGY

Moody's Analytics MARQ Score

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Abstract

Moody's Analytics MARQ™ (Moody's Analytics Risk Quality) score and website are tools to help small- and medium-sized businesses better manage their financial position and credit risk.

The MARQ tools allow business owners to evaluate their credit risk based on their current financial position. The tools also enable users to assess the impact of business changes on their credit risk.

The MARQ score is offered via an easy-to-use web-based portal that analyzes the financial information of a business. The data can be provided by establishing a one-time link to the business's accounting platform, by manual entry, or by uploading a spreadsheet. With this information, the MARQ portal calculates the value of financial statement items. It then computes a credit score associated with a probability of default (PD), which represents the firm's chances of not repaying its debt within the next year.

Moody's Analytics provides credit risk assessment and management tools to many of the largest financial institutions in the world. For the first time, this expertise is available to small businesses to help them evaluate and understand their credit risk.

Understanding the Credit Risk of Small Businesses

Small businesses go through different cycles – sometimes it's business as usual, and other times they may be planning for expansion, sale, or a turnaround. At various points they may require some form of external financing. Before approaching a lender, the leaders of a business should understand how attractive the business would be as a borrower, the likelihood that the business will be able to repay its debt successfully, and what level of financial risk it may incur. They also often want to understand how expansion plans may affect the credit risk of the business.

While the basic characteristics that lenders look for in small businesses have remained stable over time, the data and information available to lenders and the tools used to analyze information have advanced significantly during recent decades.

Moody's Analytics partners with banks to collect data on their lending to a variety of businesses. With this data, we can assess which businesses are likely to pay their lenders back successfully and which are at highest risk of defaulting on their debt. Lenders use models based on such data to estimate a borrower's credit risk. They incorporate this estimate into a credit assessment or score that they assign each borrower. How lenders rate borrowers is closely tied to whether or not the organization will grant credit and what the lender will require in terms of conditions on the credit.

Moody's Analytics offers the MARQ score, designed to provide a small business credit score and tools to help businesses manage their financial position and secure credit.

Businesses can use the MARQ site two ways. First, they can determine how a lender would view them in terms of credit risk given their current financial position. Second, they can evaluate how changes in their business and financial plans impact their credit risk. The MARQ score applies the principles of financial statement analysis to assess credit risk in a manner comparable to how lenders assess risk.

Who is Moody's Analytics?

Moody's Analytics, a unit of Moody's Corporation, helps organizations manage credit risk by providing software, analysis, research, and training. Banks and other financial institutions use our models and expertise when making lending decisions and monitoring the loans they've made to their customers.

Moody's Analytics RiskCalc™ – The Model Behind the MARQ Score

The MARQ score is derived from the Estimated Default Frequency (EDF™) calculated using Moody's Analytics RiskCalc™ model. The concept of RiskCalc grew from an idea originated in the 1990s to test whether or not a computer could replicate banks' credit decision processes for lending to businesses. It evolved into a tool that could estimate the probability of default by analyzing the default rates associated with different levels of leverage, profitability, debt coverage, liquidity, activity, and business size, based on a large sample of debt repayment data. The RiskCalc model also incorporates an assessment of the business environment in which a firm operates, further refining the analysis.

The RiskCalc models are based on Moody's Analytics Credit Research Database (CRD™), the world's largest private firm data consortium. The consortium is a partnership of more than 50 leading banks and financial institutions from around the world. The database contains millions of financial statements and over one million default events. RiskCalc is used by more than 500 major institutions worldwide to manage credit risk.

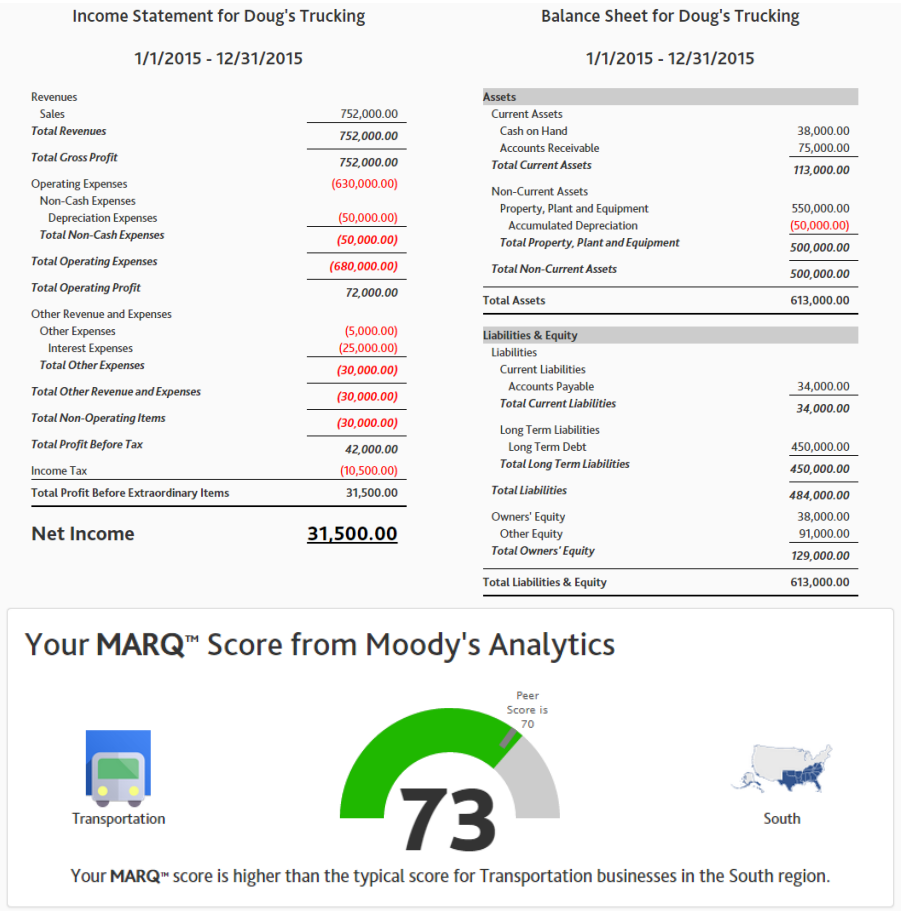
Risks in the Short-Term and Risks in the Long-Term

Some businesses borrow money to expand and have the income to support their interest payments. Other businesses are profitable and do not have debt. Some businesses borrow when they experience a rough patch, while others seek financing to provide working capital. A successful business needs cash in the short-term and must build net worth over the long term. Lenders can help businesses with their near-term cash requirements, but they expect to be paid back over the long run.

When lenders make decisions on small business loans, they calculate the likelihood that the business will be able to pay them back. In making this calculation, they look at the experiences of many businesses over time and analyze financial information to determine if a particular business is bringing in enough cash to pay its bills. They also assess whether the business is building net worth over time.

Small businesses may choose to do cash accounting for the simplicity and the potential tax minimization strategies that it offers. Cash accounting recognizes income and expenses when cash is received or paid. Above a certain size threshold, though, tax authorities will insist upon accrual accounting. Accrual accounting recognizes economic events when they are incurred, regardless of when the cash changes hands. A bank will typically attempt to compute a small business's profitability under the accrual method. For example, a business having a good year might pre-pay some expenses for the next year. Under the accrual method, a bank would seek to adjust for this and calculate profitability for the year by only considering revenue earned and costs incurred during the current year. They would consider the pre-payment as impacting the income and expenses for the following year, even though the cash has already changed hands.

Figure 1 Example of financial statements and corresponding MARQ score



Income Statement for Doug's Trucking

1/1/2015 - 12/31/2015

Revenues	
Sales	752,000.00
Total Revenues	***752,000.00***
Total Gross Profit	***752,000.00***
Operating Expenses	(630,000.00)
Non-Cash Expenses	
Depreciation Expenses	(50,000.00)
Total Non-Cash Expenses	***(50,000.00)***
Total Operating Expenses	***(680,000.00)***
Total Operating Profit	***72,000.00***
Other Revenue and Expenses	
Other Expenses	(5,000.00)
Interest Expenses	(25,000.00)
Total Other Expenses	***(30,000.00)***
Total Other Revenue and Expenses	***(30,000.00)***
Total Non-Operating Items	***(30,000.00)***
Total Profit Before Tax	***42,000.00***
Income Tax	(10,500.00)
Total Profit Before Extraordinary Items	**31,500.00**
Net Income	**31,500.00**

Balance Sheet for Doug's Trucking

1/1/2015 - 12/31/2015

Assets	
Current Assets	
Cash on Hand	38,000.00
Accounts Receivable	75,000.00
Total Current Assets	***113,000.00***
Non-Current Assets	
Property, Plant and Equipment	550,000.00
Accumulated Depreciation	(50,000.00)
Total Property, Plant and Equipment	***500,000.00***
Total Non-Current Assets	***500,000.00***
Total Assets	**613,000.00**
Liabilities & Equity	
Liabilities	
Current Liabilities	
Accounts Payable	34,000.00
Total Current Liabilities	***34,000.00***
Long Term Liabilities	
Long Term Debt	450,000.00
Total Long Term Liabilities	***450,000.00***
Total Liabilities	***484,000.00***
Owners' Equity	38,000.00
Other Equity	91,000.00
Total Owners' Equity	***129,000.00***
Total Liabilities & Equity	**613,000.00**

Short-Term Risk

In assessing short-term risk, lenders determine if the business is generating enough cash to make its debt payments. To make these payments, a company must generate revenue, and it must pay its employees and suppliers before it can pay the lender. One key metric lenders analyze is the ratio of EBITDA-to-interest expense. EBITDA stands for Earnings Before Interest, Taxes, Depreciation, and Amortization. EBITDA essentially represents how much money the business produces after it has paid its employees and suppliers. Lenders look for this ratio to be greater than one by a healthy margin – in fact, a bank would typically expect EBITDA to be more than three times the level of interest expense.

EBITDA can be calculated from the income statement as Operating Profit plus Depreciation Expenses and then compared to interest expense. The higher the ratio, the lower the risk. In the example of a trucking company in Figure 1, the business's EBITDA is $122,000 (Total Operating Profit plus Depreciation Expenses), almost 5 times the Interest Expense of $25,000. Such a multiple indicates relatively low default risk. It means that the company is generating enough cash to meet its short-term needs and has something left over to pay taxes and make some capital expenditures.

Capital expenditures are purchases or upgrades of physical assets that have a useful life of more than a year. Accountants treat capital expenditures differently than purchases used to produce goods and services for sale. Rather than expensing them right away, a proportion of the cost of the asset is expensed through depreciation each year over the expected useful life of the asset. For example, the purchase of a computer could be depreciated over a three-year period, or the purchase of office furniture may be depreciated over a seven-year period. Spreading these expenses over several years allows the business to match the spending on a physical asset with the revenue produced by the asset over time. This principal allows a business's net income to remain undistorted in a year in which it makes large capital expenditures that are expected to help the company produce revenue for several years.

Long-Term Prospects

Lenders also seek to determine if the business is building net worth over time. To build net worth, a business must have positive net income. Net income is how much money a company generates after everyone is paid: employees, suppliers, lenders, and taxes, and after an allowance is made through depreciation to account for the fact that capital assets wear out over time and must be replaced.

Net Income, the bottom line of the income statement, relates to profitability. In the example in Figure 1, Net Income of $31,500 is 5.1% of Total Assets, which are $613,000. This indicates the company is making enough to meet its obligations – it is able to pay its debt, employees, suppliers, and taxes, and to replenish its physical assets – and there is also some money left over that can accumulate as additional net worth. This positions the business to withstand market changes and allows it to comfortably take on additional debt. Lenders typically view such a level of profitability as solid and associate it with a moderate to low level of default risk.

What is the MARQ Score and What Does It Mean?

A MARQ score is a quantitative measure of credit risk. It is derived from a model that measures the probability that a business can successfully repay its credit. Key factors in the analysis are EBITDA-to-interest expense, net income-to-assets, the stability of net income-to-assets, and the ability of the firm to accumulate retained earnings over time. Additionally, MARQ looks at leverage, liquidity, size, and activity ratios. The MARQ score then maps this information to a probability of default.

The MARQ score is calculated from 11 financial statement ratios derived from 20 inputs from current and prior-year financial information. The ratios are used to evaluate the potential creditworthiness of a business based on historical data on whether or not private businesses with similar characteristics have successfully repaid their debt in the past. The score also takes into account information on economic conditions and how they might affect the business's ability to pay back its debt.

When a business gets a loan, the lender provides terms that typically include limits on additional borrowing, covenants, and collateral requirements. For a term loan, the borrower and lender agree on an interest rate and a repayment schedule. For a revolving line of credit, there is typically a usage fee and a commitment fee. In deciding what terms to offer, the lender determines the borrower's credit risk. Lenders usually offer better terms to attract low-risk borrowers. When negotiating with high-risk borrowers, lenders seek a combination of higher interest rates and fees, tighter limits, more collateral, and more restrictive covenants.

In determining credit risk, lenders analyze a business's financial statements in a manner similar to that of the MARQ score. The score in the example in Figure 1 is 73, which contrasts with a peer score of 70, as shown on the score dial. This score indicates that the business has a lower probability of defaulting on its credit than others in its industry sector and region. The peer score represents the midpoint of companies in the relevant comparison group, so half of the companies in the sector (Transportation) and region (South) have a score higher than 70 and half have a lower score. The Transportation sector in this scenario could be facing a changing business environment stemming from an economic downturn and rapidly rising gas prices.

Lenders may also consider qualitative factors not captured by the financial statements. These factors include management experience, the competitiveness of the industry, and the outlook for the business. The lender may also consider whether or not the business has a history of repaying its debt and whether or not an effective system of accounting controls is in place. Finally, lenders are likely to consider the personal creditworthiness of the head of the business and guarantors, especially for smaller businesses.

Percentile Ranking, MARQ Score, and Probability of Default

The median MARQ score across businesses in the Moody's Analytics Credit Research Database is 76. A MARQ score above 83 falls into the top quartile of businesses, which means the business is in the top 25% in terms of its likelihood of repaying its credit when compared to other private companies. MARQ scores below the median may indicate a higher level of credit risk.

MARQ scores vary by industry because some types of business are inherently riskier than others. MARQ generates a comparative peer score, which shows on the meter with the MARQ score. The peer score is chosen so that one half of the sample scores above it, and one half scores below.

Figure 2 Relationship between the MARQ score and the probability of default

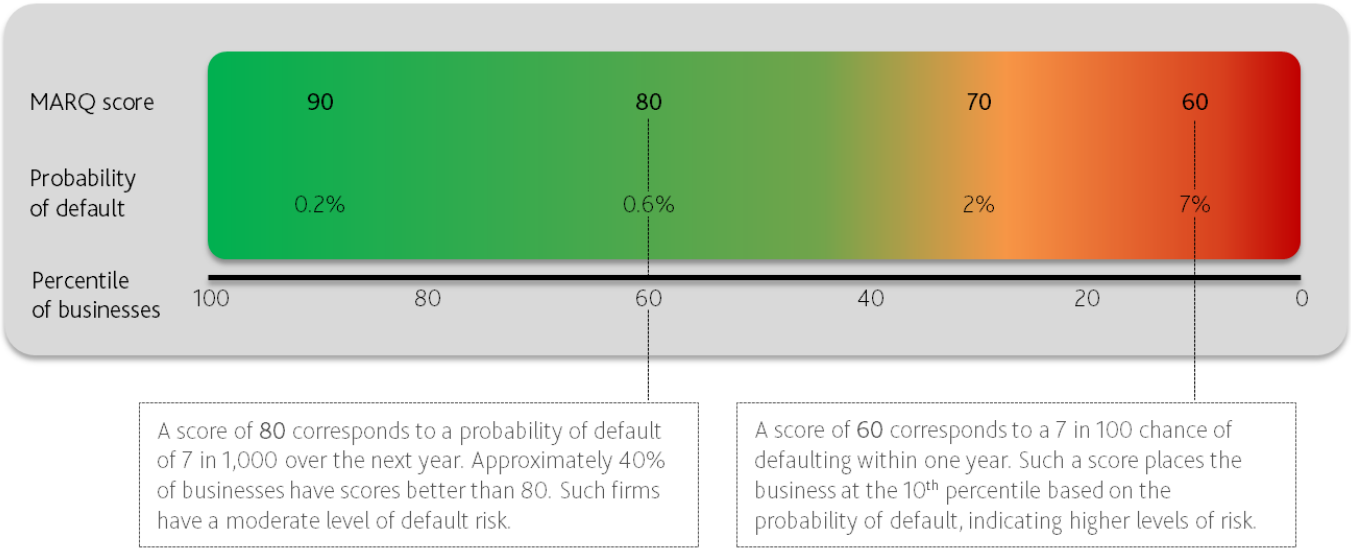


Figure 3 Clusters of Different Types of Businesses

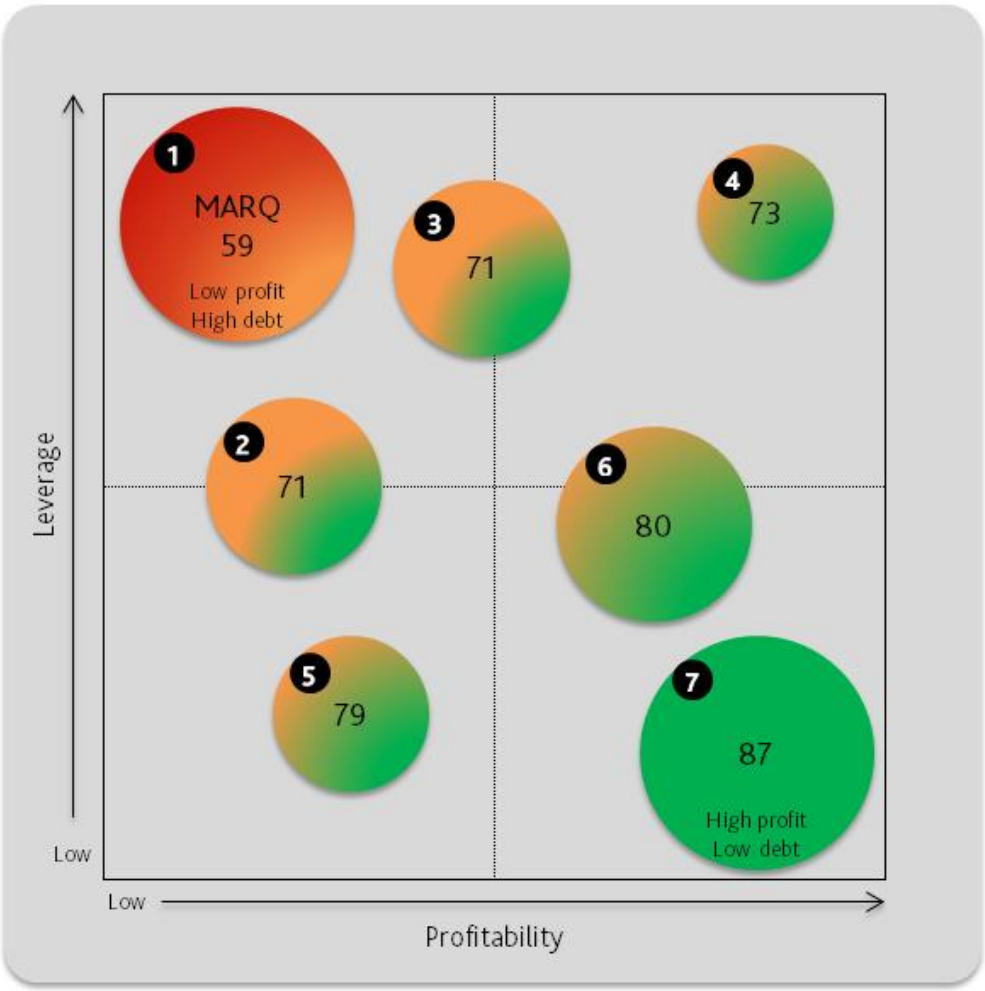


Figure 3 shows which business types are considered more and less risky by the MARQ analysis. It shows the seven most common groups of businesses clustered by their risk drivers, based on profitability and leverage. Leverage is the debt a company uses to buy more assets. Table 1 provides the typical characteristics of each cluster.

Cluster 1 corresponds to the highest level of credit risk. In this cluster we observe relatively low profit and high leverage. Typical firms in this category lose 4% of assets per year and have liabilities in excess of their assets (103%). They have a MARQ score of around 59 and about a 7-in-100 chance of defaulting on their debt within one year.

Moving in the direction of lower risk, down and to the right, Clusters 2 and 3 have a MARQ score of 71. Cluster 2 has a moderate amount of leverage but lower profits, and Cluster 3 has higher leverage but more moderate profitability. Continuing to move in the direction of lower risk, Clusters 5 and 6 have either low leverage and low profits or moderate leverage and higher profitability.

In Cluster 4, we find relatively high levels of both profit and leverage. Such firms are likely to be expanding rapidly. They have a moderate amount of credit risk.

Businesses in Cluster 7 show low leverage and high profitability. The typical firm in this category has a MARQ score of 87, a 20% return on assets, liabilities of approximately 30% of Assets, and a 1-in-300 chance of defaulting on their debt within one year (0.32%).

Table 1 Characteristics of Different Clusters of Small Firms

Cluster	Cluster Type		Return on Assets (%)	Total Liabilities to Total Assets (%)	MARQ score	Probability of Default (%)	Est Percent of Business (%)
1	Low Profit	High Debt	-4.12	103	59	7.29	14.83
2	Low Profit	Moderate Debt	0.26	67	71	1.77	13.50
3	Moderate Profit	High Debt	3.78	86	71	1.65	13.84
4	High Profit	High Debt	21.05	97	73	1.37	9.97
5	Low Profit	Low Debt	1.12	36	79	0.68	13.03
6	High Profit	Moderate Debt	9.10	62	80	0.60	17.32
7	High Profit	Low Debt	20.32	30	87	0.32	17.51

Impact of Financial Changes

The MARQ portal allows businesses to evaluate the impact of financial changes on their credit risk. Using the illustration of the trucking company shown in Figure 1, suppose its sales drop from $752,000 to $684,000 and its operating expenses increase from $630,000 to $642,000 due to a change in the business environment. For example, the sales of a trucking company could go down while its costs simultaneously go up if an economic downturn lowers the demand for shipping and oil prices rise. The company's income is now borderline in terms of its ability to pay back its debt. The drop in sales causes its EBITDA to fall to $42,000, calculated as Total Operating Profit of -$8,000 plus depreciation of $50,000. This exceeds interest expense by a small margin (EBITDA to Interest Expense = 1.68). Net Income also falls, to -$28,500. As the business is now losing money (5.4% of assets) and barely bringing in enough cash to make its interest payments, the MARQ score falls to 56, which is below the comparative score and corresponds to a probability of default of around 10%. These finances would cause concern for a lender, who would likely request a turnaround plan.

Figure 4 Financial Statements after a Large Reduction in Revenue and Increase in Costs

Income Statement for Doug's Trucking

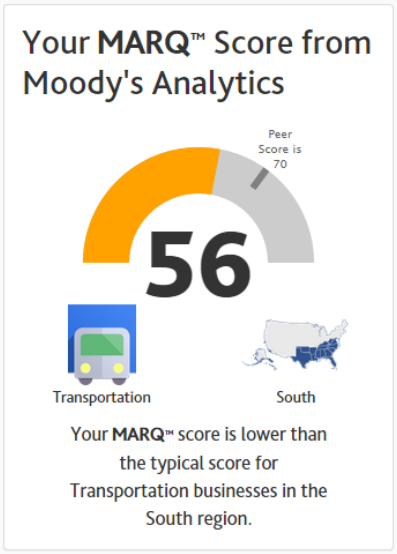
1/1/2015 - 12/31/2015

Revenues	
Sales	684,000.00
Total Revenues	***684,000.00***
Total Gross Profit	***684,000.00***
Operating Expenses	(642,000.00)
Non-Cash Expenses	
Depreciation Expenses	(50,000.00)
Total Non-Cash Expenses	***(50,000.00)***
Total Operating Expenses	***(692,000.00)***
Total Operating Profit	***(8,000.00)***
Other Revenue and Expenses	
Other Expenses	(5,000.00)
Interest Expenses	(25,000.00)
Total Other Expenses	***(30,000.00)***
Total Other Revenue and Expenses	***(30,000.00)***
Total Non-Operating Items	***(30,000.00)***
Total Profit Before Tax	***(38,000.00)***
Income Tax	9,500.00
Total Profit Before Extraordinary Items	**(28,500.00)**
Net Income	**(28,500.00)**

Balance Sheet for Doug's Trucking

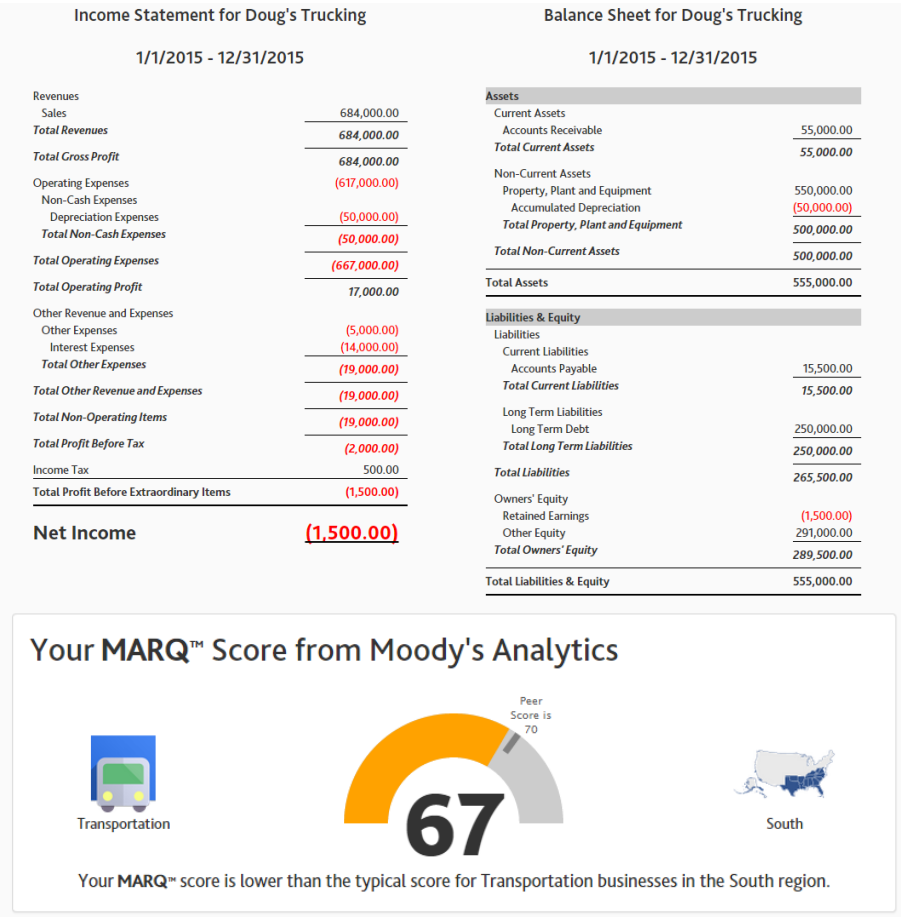
1/1/2015 - 12/31/2015

Assets	
Current Assets	
Accounts Receivable	26,000.00
Total Current Assets	***26,000.00***
Non-Current Assets	
Property, Plant and Equipment	550,000.00
Accumulated Depreciation	(50,000.00)
Total Property, Plant and Equipment	***500,000.00***
Total Non-Current Assets	***500,000.00***
Total Assets	**526,000.00**
Liabilities & Equity	
Liabilities	
Current Liabilities	
Accounts Payable	13,500.00
Total Current Liabilities	***13,500.00***
Long Term Liabilities	
Long Term Debt	450,000.00
Total Long Term Liabilities	***450,000.00***
Total Liabilities	***463,500.00***
Owners' Equity	
Retained Earnings	(28,500.00)
Other Equity	91,000.00
Total Owners' Equity	***62,500.00***
Total Liabilities & Equity	**526,000.00**



One approach to a turnaround plan is to bring in an outside investor. Suppose an investor purchases a share in the company for $200,000, and the investment is used to pay down the long-term debt from $450,000 to $250,000, which reduces interest expense from $25,000 to $14,000. At the same time, $25,000 of non-essential operating expenses are eliminated. This reduction in expenses increases the EBITDA-to-interest expense ratio to 4.8, and the net income increases to -$1,500 (-0.3% of assets). The MARQ score would increase to 67 (Figure 5), reflecting a drop in the probability of default within one year to about 2.8%. This debt pay-down would be a meaningful step in the right direction. Nevertheless, the score remains below the peer score for similar companies. We expect the bank would continue to monitor the company closely for improvements or sustained high levels of risk.

Figure 5 Financial Statements after the Debt Pay-down

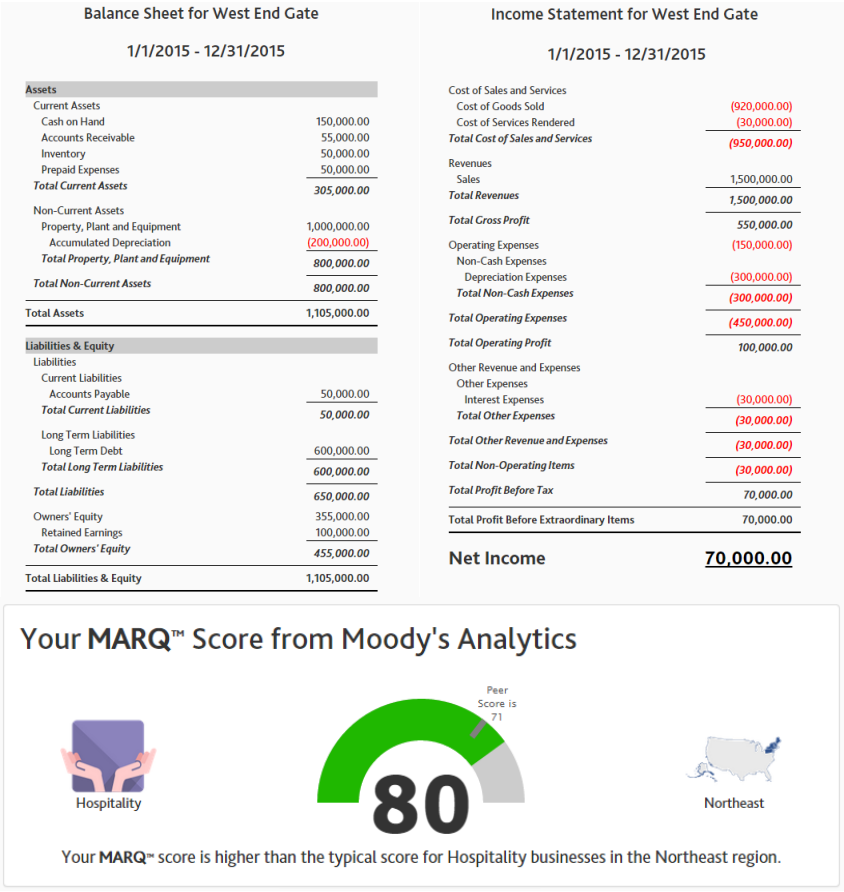


Evaluating Business Expansion

A business with solid profits and little debt may want to expand. Expansions often require taking on debt to invest in the business. In the short term, expansion can lead to a decline in profitability. In this scenario, the business must manage its debt and profitability carefully to avoid shifting too far in the direction of elevated credit risk.

For example, suppose a restaurant generates $1 million in sales and $100,000 in operating profit, and the restaurant has no debt. They want to open a new dining room that will increase sales and operating income by 50%. To expand, they must renovate and borrow $600,000, adding interest payments of $30,000 per year. How will this expansion affect their credit risk?

Figure 6 Financial statements after a business expansion



On basis of this information alone, we expect the credit risk of the business to remain relatively low. The $100,000 in operating income and the $30,000 in interest payments imply an EBITDA-to-interest expense ratio above three, even if revenue does not increase as planned. If the business does not significantly increase its non-operating expenses, net income should be positive as well. We expect such a firm to receive a good MARQ score. Figure 6 shows the MARQ score after the expansion. As expected, credit risk remains relatively low. Despite the increase in debt and interest expense, the MARQ score is 80, markedly better than the typical score for the industry. This score corresponds to a probability of default of less than 6-in-1,000 over the next year.

Summary

The MARQ site allows businesses to evaluate their level of credit risk based on their current financial position and enables them to estimate the impact of changes in their business on their creditworthiness. Using the simulation and action plan tools, a user can systematically assess the impact of expansion, increased debt, or other changes on credit risk by evaluating the business with a hypothetical financial statement.

The MARQ site uses statistical analysis to assess the financial information of a business. The financial information can be provided by establishing a one-time link to the business's accounting platform, manually entry, or upload of a spreadsheet template. With this information, MARQ calculates the value of financial statement items and uses these to compute a MARQ credit score associated with a probability of default (PD). The MARQ score represents the business's chances of not repaying its debt within the next year. The site also allows users to model different business scenarios and to determine the credit risk associated with each.