

Methods for Evaluating Financial Risk in Small Construction Companies

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In the construction industry, the financial feasibility of a project is often evaluated using internal rates of return (IRR). While these calculations are easy to perform and understand, they fail to consider both the opportunity cost and the comparative risk of the project. All else being equal, the IRR calculation can have an inherent inclination towards risky projects and this tendency can be dangerous from a financial perspective. Larger companies have developed more sophisticated methods of evaluating the risk of a project. When performed correctly, the net present value (NPV) calculation using a risk weighted discount rate can compare projects with differing risk profiles. While the NPV is a superior calculation, developing an appropriate discount rate can still be difficult. This is especially true for small private companies. As such, residential construction industry practice is to use an IRR. This paper shows that it is possible to use a NPV analysis to compare projects in small residential construction firms. This has significance for small construction companies trying to choose between dissimilar projects or diversify their business.

Key Words: Financial Risk, Internal Rate of Return, Net Present Value, Asset Beta, Construction Investment.

Introduction

In residential construction, industry practice for analyzing financial risk is to develop the internal rate of return (IRR) for a project and see if it exceeds a generic hurdle (or discount) rate (Caulfield, 2011). This analysis ensures that a project is profitable, but it also has a number of limitations. Due to these limitations, a net present value (NPV) analysis with a risk specific discount rate is a superior method of analyzing financial risk. However, developing an accurate discount rate can be difficult for small private companies. This paper shows that the data exists to run a NPV analysis in residential construction, and demonstrates how a builder can develop the necessary company specific discount rate.

An IRR has a number of limitations that make it an unideal method of analyzing financial risk. It lacks the ability to compare projects with different levels of risk, different ratios of debt and equity, or the lost opportunity of investing in financial markets (Ross et al., 2015; Renaud, 2016). A project can also have multiple IRR's, which can lead to confusion or poor investments. All else being equal, an IRR will typically favor projects with greater risk due to their higher returns. This is a common error for many builders seeking greater profits by developing land. These builders assume (financially by using the same hurdle rate) that land development carried similar risks to their homebuilding operations. This assumption leads them to seek greater profitability in land development, without noting the increase exposure their companies face (Pirrello, 2008).

The internal rate of return (IRR) is often used as a means of determining the feasibility of projects within the construction industry, by measuring and comparing the profitability of the investment. The IRR in essence is the interest rate that makes the net present value of all cash flows equal to zero; in other words, the rate at which the net present value of costs of the investment is equal to the net present value of the benefits. A higher IRR represents a more desirable project. Unfortunately, the IRR calculation does not include the ability to factor in the risks associated with project success; for this reason the IRR calculation alone is not the best means of evaluating project feasibility.

Briefly consider the following example. You are presented with two construction investment opportunities, each requiring a $1,000,000 upfront payment and lasting for 3 years. Investment A will pay $1,250,000 at the end of 3 years, generating a 7.5% annual return. On the other hand, Investment B will pay $1,500,000 at the end of 3 years, generating a 13.6% annual return. Which investment is better? Without any additional information provided, it appears that Investment B is the better choice. However, suppose that Investment A will have a 99% chance of success, while Investment B will only have a 95% chance of success. What if the likelihood of success for Investment B drops to 80%, or even 50%? Now which investment is the better choice? At some point Investment A becomes the superior investment, but at what point should Investment A be selected over Investment B? This question is difficult to answer using an IRR.

Risky construction investments always require higher rates of return to justify pursuing. However, when analyzing projects with unequal amounts of risk, the decision making process becomes more complicated. A simple IRR calculation identifies which project will give the highest total return, but not the highest risk weighted return. More sophisticated methods of analyzing projects with different levels of risk have been developed and are utilized by large development companies. For example, Choi (2013) investigated the relationship between asset risk and financial leverage in explaining the value premium for estimating market returns. Korteweg (2010) demonstrated the role of leverage within financial analysis, and indicates that smaller companies often have lower average leverage than big firms, even though they may have higher optimal-debt ratios. Both of these papers serve as examples of the types of sophisticated methods that have been developed for analyzing financial risk. However, there are limitations to using these more complex methodologies outside of large publicly traded companies. This paper explores these limitations and ways in which they can be overcome for small to midsize contractors.

The Security Market Line

Consider the example from the previous section. Using an IRR, Investment B will always be the superior investment due to its higher rate of return. However, what if Investment B is riskier or less certain than Investment A? Using a NPV, different discount rates can be applied, factoring the increased risk into the project. Using this example, if Investment A requires a 5% rate of return, its NPV is $75,000. If Investment B requires a 9% rate of return it is still superior, with a NPV of $145,000. However, at 12%, Investment A is superior with the NPV for B at $47,000. This raises the question as to how to best determine the 5, 9, and 12% rates of return?

For this analysis to be effective there needs to be a measure of the increased reward investors require to take on the additional measure of risk. In general terms, and assuming investors are impartial, investors would seek to replace underperforming investments. As the supply of underperforming investments increases and demand correspondingly decreases, the cost of the investment would also decrease. This results in an increase in the return on the investment. The reverse would also be true for investments that are overperforming the market. This self-correcting mechanism in the market forces a linear relationship between the risk and the reward called the security market line (Ross et al., 2015). The linear relationship between risk and reward is important because it allows the quantification and comparison of risks between firms. By defining risk as the variance in an investment's return, it can be quantified by regressing the variance in returns against an indicator of the market's variance (i.e. S&P 500 index). Using the example from earlier, assume that an investment with a 99% chance of success has approximately 0.2 units of market risk, and an investment with a 95% chance of success has 1.5 units of market risk. Further, assume that for the security market line, 0.2 and 1.5 units of market risk require a 5% and 13% return, respectively. Using these assumptions, Investment A and B's risks can now be quantified and compared. Using these discount rates, Investment A has a NPV of $75,904, and Investment B has a NPV of $17,528, clearly demonstrating that in this case Investment A is the better investment when factoring risk into the calculation.

Problems Measuring Financial Risk in Construction

The ability to compare investments with differing levels of risk is one reason a NPV is vastly superior to an IRR. However, measuring the actual risk in a company is difficult. Public companies can easily regress their stock's variance against the market's variance. This provides managers with a broad measure of how risky investors feel their company is compared to the market as a whole. However, private companies have limited options for measuring their risk.

One way a private company could develop a risk profile is by comparing themselves against a similar public company. However, this would require the assumption that the companies also face similar risks. There are formulas that have been generated to compensate for differences in the capital structure of companies, but these still require a comparable company. It should be noted that the publicly traded residential contractors with risk profiles are very large developers, and it would therefore be a stretch to assume that a contractor building only fifty homes per year is comparable to the larger organizations such as PulteGroup, D.R. Horton, or KB Homes. This then brings up two important questions: Due to the lack of comparable companies for small to mid-size home builders, are these more sophisticated analyses even applicable to small contractors? Also, can appropriate discount rates be developed for different risks contractors face?

There are several areas where the more sophisticated analysis would prove useful for a small contractor. Most contractors have a few different distinct business avenues. For example, a residential contractor might develop land, build houses, and own rental properties. Likewise, commercial contractors often build in multiple segments such as healthcare, education, infrastructure, commercial, or government. Given a limited amount of capital, contractors are faced in deciding which segment they should target. Similarly, contractors must decide whether or not each segment should have the same profit margin. Measuring the risk appropriately in these areas would allow contractors to adequately allocate their resources. While there are great advantages to measuring and quantifying financial risk in an investment, the difficulties and lack of understanding in measuring financial risk have prevented its use by small and midsize private firms. However, experts agree that developing an appropriate discount rate is valuable even for small firms (Tatum, 2010). The next section describes potential methodologies for developing an appropriate discount rate for small to midsize residential contractors.

Methods for Developing an Appropriate Discount Rate

There are two primary methods for developing the discount rate for a private company: regressing market returns for public companies and adapting the discount rate adapted for a private company, or observing the capitalization rate for similar investments that have recently sold. Each of these methods has application for private contractors. Capitalization rates would be easy to observe for investment properties, while there are hundreds of public contractors to compare market returns. This section shows how to develop a private required rate of return by analyzing publicly traded residential contractors. Later, a case study is provided to illustrate how to use these rates in practice. It should be noted that the information contained within this paper describes a process and not specific numbers to be used, because market values are continuously changing.

Regressing Market Returns

To develop a required rate of return through market regression requires multiple comparable public companies. For this study, a list of publicly traded residential contractors was obtained from a directory of public companies in industry (Reuters, 2014). Each company's equity beta (a measure of systematic risk), market capitalization, interest bearing debt, effective tax rates, and trading volumes were then obtained. In addition, each company was briefly researched to determine areas of operation, target markets, time since initial public offering (IPO), and any other factors that would affect the risk of the company.

It is commonly accepted that one of the largest components of a company's financial risk is the level of debt the company holds. The capital structure is also easily controlled and manipulated by management. For these reasons, it is necessary to compensate for the effect debt has on a company. To compensate for this effect the equity beta, β_E, is "unlevered" using the following equation (Brigham and Houston, 2014):

$$\beta_A = \frac{\beta_E}{\left(1 + (1 - effective\ tax)\frac{Debt}{Market\ Cap}\right)}$$

This equation generates a measure of systematic risk called that beta of assets, β_A, that allows for a comparison of the relative business risk between firms. Because the beta of assets is comparable between firms, firms in similar industries should have similar asset betas. Table 1 includes a list of the publicly traded companies analyzed in this study, their equity beta, calculated asset beta, and other relevant information on the companies regarding trading volume and history. This information can be obtained at any publicly available stock trading website. It should be noted that the data shown in Table 1 changes over time with differing market conditions. Fernandez (2012) warns about using historical betas because of the regular fluctuation. Methods have also been developed for filtering beta data and minimizing the effects of data spikes (Chen and Reeves, 2012). Note that the outliers in Table 1 have either limited trading volumes or a limited amount of trading history, both of which would affect the stock price regression. The companies at the lower end of the range are dominated by companies with really low trading volumes and/or a short data history. At the upper end of the range, both PulteGroup and AV Homes, Inc. (AVHI) are much more significant outliers. AVHI could possibly be affected by the limited amount of return history, while one possible explanation for PulteGroup could be the company's merger with Centex Corporation. Regardless of the reasons, the market feels these two companies are significantly more risky than the residential construction industry in general, and therefore they will be excluded from further analysis. After excluding the outliers from both ends of the list, the remaining asset betas form a much tighter cluster varying between 0.91 and 1.33, with the majority centered even tighter between 1.02 and 1.19. There is not a material difference between these asset betas as will be shown later.

Table 1: Risk values for publicly traded residential companies

Company	β_E	β_A	Comments
NVR, Inc.	0.52	0.48	Really Low Volume
HomeFed Corporation	0.63	0.62	Really Low Volume
Taylor Morrison Home Corporation	1.78	0.81	Only 2 years data
Tripoint Homes	0.976	0.84	Only 2 years data, Low Volume
Hovnanian Enterprises Inc.	2.34	0.91	
Lennar Corporation	1.47	0.97	
Standard Pacific Corporation	1.65	1.02	
M/I Homes, Inc.	1.67	1.03	Midrange Volume
Beazer Homes USA Inc.	3.4	1.06	
Toll Brothers Inc.	1.38	1.10	Midrange Volume
Meritage Homes Corporation	1.54	1.11	
DR Horton Inc.	1.53	1.13	
Comstock Holding Companies, Inc.	2.13	1.17	Low Volume, Builds Apartments
KB Home	2.36	1.18	
Ryland Group	1.77	1.19	
M.D.C. Holdings, Inc.	2.06	1.33	
AVHI Homes, Inc.	1.98	1.61	Only 5 years data
PulteGroup	2.27	1.90	

At this point, choosing the exact asset beta should be based on qualitative factors. A lower asset beta is more aggressive while a higher asset beta is more conservative. Another factor to consider would be the similarities between the target company and the comparison company. The companies should face very similar risks, because this analysis assumes the two company's financial risk profiles are the same. Using the asset beta for the target company, an equity beta can then be developed for the target company by "relevering" the asset beta (the reverse of the formula shown above). The capital asset pricing model (CAPM) can then be used to determine a required rate of return on the investment (Brigham and Houston, 2014; Dempsey, 2013; Mehrling, 2005). The equation for determining the CAPM is:

$$R_e = R_f + \beta_E(R_m - R_f)$$

where R_e is the required return on equity, R_f is the risk free rate (US treasury 10 or 30 year rate), ($R_m - R_f$) is the market risk premium (5-7% for the aggregate), and β_E is the equity beta for the target company. Table 2 shows the required return on equity for each asset beta generated above, and the associated debt structure of the company in 10% increments.

The final step in generating an appropriate discount rate is pairing the required return on equity with a required return on debt. Current interest rates for Baa rated companies is 6%. The credit rating is a financial indicator of debt securities such as bonds. Using this and the required rate of return for equity shown above, the company can develop a weighted average cost of capital (WACC) for the company using this formula (Brigham and Houston, 2014):

$$WACC = \frac{E}{D+E}R_E + \frac{D(1-t)}{D+E}R_D$$

where E is the market value of the firm's equity, D is the market value of the firm's debt, and t is the corporate tax rate.

Table 2: Required Rate of Return

β_A	10%	20%	30%	40%	50%	60%	70%	80%	90%
0.48	6.7%	7.0%	7.3%	7.8%	8.4%	9.3%	10.9%	14.1%	23.5%
0.62	7.6%	7.9%	8.4%	9.0%	9.8%	11.0%	13.0%	17.1%	29.2%
0.81	8.8%	9.3%	9.8%	10.6%	11.6%	13.2%	15.9%	21.1%	37.0%
0.84	9.0%	9.5%	10.0%	10.8%	11.9%	13.5%	16.3%	21.7%	38.1%
0.91	9.4%	9.9%	10.5%	11.4%	12.6%	14.3%	17.3%	23.2%	40.9%
0.97	9.8%	10.3%	11.0%	11.9%	13.2%	15.1%	18.2%	24.5%	43.4%
1.02	10.1%	10.7%	11.4%	12.4%	13.7%	15.7%	19.0%	25.6%	45.5%
1.03	10.2%	10.8%	11.5%	12.4%	13.8%	15.8%	19.1%	25.8%	45.9%
1.06	10.4%	11.0%	11.7%	12.7%	14.1%	16.2%	19.6%	26.5%	47.3%
1.10	10.7%	11.3%	12.1%	13.1%	14.5%	16.7%	20.3%	27.4%	49.0%
1.11	10.7%	11.3%	12.1%	13.2%	14.6%	16.8%	20.4%	27.6%	49.3%
1.13	10.9%	11.5%	12.3%	13.3%	14.8%	17.0%	20.7%	28.1%	50.1%
1.17	11.1%	11.8%	12.6%	13.7%	15.2%	17.5%	21.3%	28.9%	51.8%
1.18	11.2%	11.9%	12.7%	13.8%	15.3%	17.6%	21.5%	29.2%	52.3%
1.19	11.3%	11.9%	12.7%	13.8%	15.4%	17.7%	21.6%	29.3%	52.5%
1.33	12.1%	12.9%	13.8%	15.0%	16.7%	19.3%	23.7%	32.3%	58.2%
1.61	14.0%	14.8%	16.0%	17.5%	19.6%	22.7%	27.9%	38.4%	69.9%
1.90	15.8%	16.9%	18.2%	19.9%	22.4%	26.1%	32.3%	44.7%	81.7%

Other Factors

While determining the WACC as demonstrated above is a valid and acceptable discount rate, Tatum (2010) suggested several other considerations that should be considered for small and midsize companies. Investors require small companies to return a premium compared to larger companies to compensate for the additional risk inherent in a small company. Tatum (2010) further suggested that a premium of 2.85%-6.28% should be added for companies with market values between $1 million and $200 million. Tatum (2010) also suggested that the required rate of return for venture capitalists provided good benchmarks for companies in the initial startup phases. While these discount rates are very broad, they also provide some guidance and direction for very small companies. The suggested benchmarks include returns at the startup, early development, and expansion stages as 50%-100%, 40%-60%, and 20%-40%, respectively.

Alternative Method for Developing a Discount Rate

Another simple method of developing discount rates is particularly relevant to real estate. When commercial or investment real estate is purchased, the value of the property is developed by dividing the rental income for the property by a capitalization rate (or commonly CAP rate). The CAP rates are developed by comparing the property to other investment properties that have recently sold with similar characteristics, and thus shows the rate of return investors are requiring for similar properties. Given a large enough sample, this discount rate would be appropriate for investments in rental properties. While this method will not be explored any further in this paper, it is useful for comparing rental properties with other forms of investment. It should be noted that these rates also vary with market conditions.

Example of Application

To demonstrate how to develop and utilize a discount rate using the method described previously, the following example is provided. A small residential contractor is considering two investment proposals. Due to bonding covenants and limited equity, the contractor is only able to fund one of the proposals. The first proposal includes developing a 20 unit subdivision, while the second is purchasing an apartment complex that needs some repairs. The contractor wishes to maximize the returns while minimizing the risk. The contractor's relevant financial information includes an estimated market cap (80% of worth) of $6,250,000, interest bearing debt (20% of worth) of $1,562,500, effective tax rate of 35%, and annual sales of $12,500,000.

By relevering an asset beta of 1.13, it is determined that the contractor has an equity beta of 1.31. Using the CAPM formula with a risk free rate of 0.0359, and an average market risk premium of 6%, the contractor's required rate of return on equity is 17%.

$$Equity\ Beta = 1.13\left(1 + (1 - .35)\frac{1{,}562{,}500}{6{,}250{,}000}\right) = 1.31$$

$$Return\ on\ Equity = 3.59\% + 1.31(6\%) = 17\%$$

By considering bond yields for similarly rated companies, the contractor determines that the required rate of return on his debt is 7%. Using this information he is then able to determine the discount rate for the subdivision using the WACC formula.

$$WACC = \frac{1{,}562{,}500(1 - 35\%)}{6{,}250{,}000 + 1{,}562{,}500} * 7\% + \frac{6{,}250{,}000}{6{,}250{,}000 + 1{,}562{,}500} * 17\% = 10.1\%$$

However, the contractor feels that the calculated WACC value does not account for all of the inherent company risk. Since the contractor's company is significantly smaller than most comparable publicly traded companies, there should be a size premium included within the analysis. For this reason, he adds an additional 6.28% risk factor on his subdivision section of his business. This provides a required aggregate discount rate of 16.38%. The contractor also talks to a local appraiser, and determines that currently similar rental properties have sold with CAP rates between 8-10%. Because these are market based rates, he feels confident with the discount rates.

The contractor develops proforma financial cash flows for both properties. When looking at the IRR, both properties look profitable, although the subdivision has a much higher IRR. However, a more through determination of NPV using the discount rates above shows that the apartment is a better property to purchase due to the risk of the investments. Table 3 shows the expected cash flows with both the IRR and NPV for the example given. This example demonstrates how adjusting for risk can provide a different perspective in financial decision making.

Table 3: Example net present value analysis.

Subdivision (17% Discount Rate)			Apartment (10% Discount Rate)		
Cash Flow	**Amount**	**Present Value**	**Cash Flow**	**Amount**	**Present Value**
CF0	$ (1,000,000.00)	$ (1,000,000.00)	CF0	$ (1,000,000.00)	$ (1,000,000.00)
CF1	$ 100,000.00	$ 85,470.09	CF1	$ 100,000.00	$ 90,909.09
CF2	$ 500,000.00	$ 365,256.78	CF2	$ 120,000.00	$ 99,173.55
CF3	$ 750,000.00	$ 468,277.92	CF3	$ 120,000.00	$ 90,157.78
CF4	$ 300,000.00	$ 160,095.01	CF4	$ 120,000.00	$ 81,961.61
			CF5	$ 120,000.00	$ 74,510.56
			T.V.	$ 1,178,364.31	$ 665,155.93
NPV		$ 79,099.79	NPV		$ 101,868.53
IRR		20%	IRR		12%

Conclusion

There is significant risk in relying on an IRR calculation to judge projects with different levels of risk. While the expected success or failure of the project can be considered using an IRR, it is difficult to determine which project will be the most successful after accounting for the appropriate risk. The NPV and WACC are both more sophisticated methods of accounting for risk in a project. When used correctly they can help account for financial risk, and provide a basis by which to compare projects of different levels of financial risk. However, the tools necessary to determine a project's risk are geared towards large publicly traded companies.

The NPV and WACC can be used with success in smaller firms, but with caution. There is some level of art and instinct that is necessary to use these tools, especially in small firms. When used prudently they can raise important questions and provide a means of quantifying financial risk. When used appropriately with other quantitative and qualitative measures, they can provide valuable data.

One essential aspect of this risk based analysis, is finding a comparable public company. This was mentioned, but not covered in depth. In addition, financial risk is only one element of determining a projects feasibility. Other factors including employee skillset and availability, market conditions, and operational feasibility should play a significant role in evaluating prospective projects. Future research could focus on broadening the financial analysis to show how it can be part of a holistic feasibility study.

This paper has shown how asset and equity betas for publicly traded companies can be used as an estimating tool for small to mid-size private residential companies. From this, the required rate of return versus different debt structures were produced. An example showed how this information can be used to consider risk, thus providing a more sophisticated and perhaps more appropriate decision making process, as opposed to simply using an IRR.

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