Funds from Operations to Total Debt: A More Efficient Measure of Leverage for Capital Structure Decision Making

William Procasky
Texas A&M International University

Nacasius U. Ujah
University of Nebraska at Kearney

Zubair A. Raja
Texas A&M International University

We advance the understanding of capital structure decision making by building on and expanding prior authors' work, most notably Frank and Goyal (2009). Using US firms' data from 1950-2012, we operationalize a new measure of leverage, the ratio of Funds from Operations to Total Debt, which captures 42% of the variation in capital structure compared to 25% by Frank and Goyal. Our findings suggest that prior attempts to explain variation may not have used optimal leverage proxies, relying only on "stock" (balance sheet) accounts, whereas the new proxy is comprised of both "stock" and "flow" (cash flow statement) accounts.

INTRODUCTION

For quite some time, academicians have been trying to unlock the mystery regarding what factors determine a company's capital structure. One of the most troublesome issues with this quest is that the factors, which determine the mix of funding, are not the same for every company, for example, due to differences in business risk, and even more so when the scope is expanded beyond international borders, where different tax regimes and capital market conditions may prevail. Still, as discussed starting in 1958 by Modigliani and Miller and continuing through today, there has been a lot of useful work in the field, perhaps most saliently by Frank and Goyal (2009), who from a multitude of potential contributing factors to the determinants of capital structure in US, identified six core factors of statistical and economic significance. Against that backdrop, the goal of this paper is to pick up where those two authors left off, and advance the understanding of the determinants of capital structure by introducing a more efficient measure of leverage to proxy for capital structure decisions, which we believe will aid in further understanding corporate funding structure.

Within that context, we are able to report that the scientific results of the methodology employed by Frank and Goyal (2009) and replicated here support our hypotheses that the newly introduced leverage metric is a more efficient proxy for capital structure decision making. In fact, the headline result of our work is that the six core factors identified by Frank and Goyal (2009) explain 42% of the variation in the newly introduced dependent variable as compared to 25% for the traditional dependent variable, as computed by Frank and Goyal (2009). Furthermore, in a series of robustness tests, in which we tweak the model to take into account the lag and then log of the independent variables, as well as change the timeframe and account for fixed firm affects, our newly introduced measure clearly outperforms the traditional one. As a result, we submit that our findings meaningfully advance the extant understanding of the determinants of capital structure.

But why is capital structure decision making important in the first place? Because there are significant implications as to whether a company raises debt or equity, when seeking additional capital. While the connotation of "debt" tends to be "bad" with respect to cultural norms and often evokes the specter of loan sharks preying on innocent victims (a corporation is a person after all in the legal sense), leverage in and of itself is not a bad thing, and in fact, up to a certain point, can be most beneficial for a company. Why? Because debt is less expensive than equity, meaning that the return a debt-holder expects from providing capital to an enterprise is less than the return that a shareholder expects

How is this? When a creditor makes a loan, he/she expects to be repaid the face amount of the loan at a defined period in time and the intermittent interest payments, or coupons, attached to the loan until such time that the obligation has been repaid in full. There is no upside to the arrangement as the most money that the creditor can receive back is fixed from the very beginning, including the contractual income. This is one of the reasons that loans and bonds are considered "fixed income" instruments. However, the potential downside for the debt holder is equal to the full amount of the principal it has loaned. In the event the company becomes distressed and does not repay the debt as codified in the debt agreement, the company likely will have to file for bankruptcy, and only a partial recovery of principal will occur. As an example, bondholders of Enron's senior debt recovered on average only $0.14 - $0.19 for every $1 of par the amount they loaned[1]. So as visibly seen, the creditor has almost everything to lose and comparatively little to gain, with this asymmetrical risk/reward profile making the providers of such capital typically conservative in the types of conditions they will grant.

The contractual arrangements and risk/reward profile for shareholders, on the other hand, are entirely different, as "intermittent' payments to the shareholders, called dividends, are discretionary in nature, i.e., the company contractually does not have to pay them. In addition, there is no due date on the invested capital, i.e., unlike a loan, shareholdings do not ever have to be repaid. Of course, what the shareholder does expect, in return for its provision of capital under flexible terms, are capital gains, or upside appreciation in the share price of the company, and this expected return is much higher than the contractual income received by a debt-holder, given the subordinated claim on the cash flows generated by the company that the shareholders have, i.e., they are only repaid in the event there is enough cash to first pay the debt holders.

And so, there is a tradeoff between the advantages and disadvantages of one capital structure over another and this gives rise to differences across firms in their mix of funding, hence the genesis of theories attempting to explain the choices they make (the notion that debt is beneficial up to a certain point, after which time it is not and as such, raises the probability of distress is explicitly captured in one of these theories, aptly named the "Trade-Off" theory. On the one hand, debt is very cheap and as such, can be a cheap way to expand the size of the company, as long as it has enough debt capacity to take on the obligation it enters into. On the other hand, if the company is not able to repay the debt according to the agreed upon schedule, it will experience financial distress which could ultimately lead to bankruptcy and/or the extinguishment of shareholder value. Of course, such is not a problem with shareholder capital, since there is no schedule governing when it must be repaid, however it generally would not be prudent to capitalize a company (public) entirely with equity, because shareholders expect very robust capital appreciation, and the growth rate required to satisfy such expectations may be too high for the company to achieve, especially once it becomes mature, thus ultimately also resulting in a loss of shareholder value due to a potential increase in the cost of that equity capital to adjust for the lower growth rate.

As a result of this trade-off, companies generally make use of both types of capital under differing circumstances, and there is no one universal formula for the ideal mix, which brings up an interesting issue: just what is the ideal mix of debt and equity in a company's capital structure? And how is this ideal, or "target" capital structure determined? This has significant implications for the valuation of the company, since the weighted average cost of capital determines the average return required by investors and creditors.

And so, with no extant theory completely satisfying the determinants of capital structure (of the three most popular, the Trade-Off, Pecking Order and Market Timing theories, the Trade-Off arguably comes the closest) we make a significant contribution to the literature by taking a look at Frank and Goyal's (2009) research from a different angle. Specifically, we are going to first use their methodology, which uses a traditionally accepted balance sheet, or "stock" based proxy for capital structure, the Total Debt/Market Value of Assets ratio, to test the robustness of their six core factors, or determinants of capital structure, from the end of their researched timeframe (2003) to the present day (2012) in order to further validate and update their explanatory power. In addition and more significantly, we then are going to introduce a new and ostensibly, better measure of leverage that proxies for capital structure, which unlike the traditional ratio used by Frank and Goyal as well as others employed/considered in capital structure analyses, examines the concept of leverage from a never before examined modified "flow" perspective. Specifically, the ratio examines leverage from both a balance sheet *and* cash flow statement perspective and hence, captures information that previously utilized stock and flow measures based on a single statement, i.e., the balance sheet or income statement, did not. We subsequently compare and contrast the ability of the six core factors to explain the variation in this and the traditional ratio used by Frank and Goyal, postulating that the explanatory power under the newly introduced dependent variable proxy will be higher.

The contributions of this paper are relevant to a multitude of stakeholders, first and foremost to academicians researching the determinants of capital structure, as it opens up an important new frontier of research rooted in examining "flow-based" measures of leverage. By utilizing these more efficient measures, researchers can enhance the knowledge and explanatory power of factors contributing to capital structure related decisions. In addition, chief financial officers charged with raising firm capital can benefit from better understanding the general framework within which this capital is raised, thereby aiding in framing optimal capital structure decisions that may increase the value of the firm. Finally, financial analysts analyzing the probability of firm financial distress can utilize the stream of research to potentially better identify when a firm may be in danger of losing access to the debt capital markets, based on its prevailing mix of capital structure related determinant factors.

This paper is structured in the following manner: Section 2 reviews the relevant literature in the field as well as introduces the new dependent variable while Section 3 describes and discusses the data along with the independent and control variables. Section 4 introduces the methodology and discusses the empirical results as well as robustness tests. Section 5 concludes and identifies potential avenues of future research.

LITERATURE REVIEW

To be sure, since there have been active capital markets bringing together borrowers and lenders in an ostensibly efficient manner, researchers have been trying to identify what the specific factors are that influence management's decisions in determining the target capital structure. And while many of the theories that have been advanced have differing levels of merit, none of them has been able to definitively determine managers' motivations in every circumstance, hence leaving us with a gap in the extant literature to this very day. So against that backdrop, is it as much art as science?

The whole concept of capital structure and its ideal composition really took root in 1958, when Modigliani and Miller (1958) published their famous paper arguing that capital structure was irrelevant in determining the value of a company, meaning that the mix of debt and equity used to fund assets did not really matter. However, in coming up with this postulation, the authors stipulated five conditions that must be present, yet do not hold other than in their theory, namely no taxes, no bankruptcy costs, existence of perfect information (no asymmetries), the ability for borrowers and lenders to issue debt at the same rate (thus avoiding arbitrage) and the independence of financing decisions from investment decisions are independent of financing decisions. So while useful in jumpstarting the discussion, the irrelevance of capital structure theory is not practical.

Another prevailing theory which has received attention in the literature stream is that of Pecking Order (Donaldson (1961) Myers (1984), Shyam-Sunder and Myers (1999), Fama and French (2002) and Frank and Goyal (2003)). According to this theory, managers of a company use retained earnings first, and only when this source of funds has been exhausted, move to issue debt, and only when its debt capacity has been completely exhausted, move to issue equity, given that equity is the most expensive form of capital. While debt certainly is less expensive than equity and managers may want to use internal funds before going to the market to raise capital for the sake of simplicity, retained earnings are still a form of equity, and as such, expensive. In fact, they are just as expensive as newly issued equity. Also, if this theory were to hold, you would never see firms with paid-in equity capital on their balance sheet, while issuing debt. So clearly, this theory has its shortcomings.

Focusing on external conditions as opposed to solely internal, the Market Timing theory has garnered some merit (Lucas and McDonald (1990), Graham and Harvey (2001), Hovakimian, Opler and Titman (2001), Baker and Wurgler (2002)) in that it predicates the type of capital being raised on the "hottest" market at the time, or the one which gives the company comparative advantage. For example, if the Price/Book or Price/Earnings ratio is high at a given time, the firm will move to issue equity, given its comparative cheapness. Conversely, if interest rates are generally low, or the interest rate curve is flattening, companies will issue may opt to issue debt due to its relative cheapness, both in terms of the coupon, as well as the maximum length of maturity that the firm can get. In this way, managers are able to maximize as company's financial flexibility. Of course, this theory also has the obvious shortcoming that it fails to take into consideration why firms facing the same conditions make different decisions, i.e., one of the markets is typically more cost-effective than the other on a macro-basis, so why don't individual firms all chose the same option?

Of all the extant theories perhaps the one with the most credence is that off the Trade-Off theory, which basically involves a trade-off between the "tax-bankruptcy" costs of debt (DeAngelo and Masulis (1980), Bradley, Jarrell and Kim (1984), Barclay and Smith (1999), Myers (2001), Dudley (2012)). What does this mean? Up until a certain point in time, the tax benefits of debt provided by its tax shield (interest expense can be deducted before calculating taxable income) will be greater than the expected costs of financial distress, or bankruptcy (which we can estimate as the amount of interest bearing debt times the expected default rate times the recovery rate). This relationship will continue until the firm has achieved its "target capital structure", or the point where the marginal value derived from the tax shield is equal to the expected cost of bankruptcy. However, after this point, the expected costs of bankruptcy will begin to rise at an amount greater than the incremental value of the tax shield, meaning that incremental debt will begin to destroy value for the company, and it will cease and desist with the issuance debt in favor of equity. While this view definitely has some merit and tends to balance theory and reality a little better than the prior ones, one of its primary shortcomings is that the optimal, or target capital structure is endogenously driven, meaning that each firm will have its own unique structure. In addition, the concept of an optimal capital structure also remains a bit theoretically elusive.

Finally, discarding theoretical drivers of capital structure for empirically driven ones (in the vein of Titman and Wessels (1988) and afterwards, Akhtar (2012)), Frank and Goyal (2009) expanded the research by looking at which specific factors are "reliably important" in determining/predicting the amount of debt in a firm's capital structure, or leverage, using comprehensive panel data for US firms from the time period 1950-2003. Under this process, the authors determined that there were six core factors robust enough to determine the amount of leverage as modeled by the Total Debt/Market Value of Assets ratio as the dependent variable. Specifically, the six factors were (i) industry median leverage, (ii) market to book value of assets, (iii) tangibility, (iv) profits, (v) firm size and (vi) expected inflation. While this finding undoubtedly has some practical applications, one drawback is that these factors only explained 27% of the variation in leverage over time in their study, with another 19 factors only explaining an additional 2%. So clearly, there are some material factors not identified in the study which tell a lot of the story in terms of drivers of capital structure. And of course, the dependent variables used in the analysis and attendant robustness tests were all balance sheet based, and hence did not take into account cash flow. These factors, taken together spawned our initial interest in examining the determinants of capital structure further.

With respect to the measures of leverage that have been used in the literature to proxy for capital structure, there have been a multitude to date, all of which have certain weaknesses identified by Rajan and Zingales (1995) and that we believe are appropriately addressed by our proposed measure. The types of measures generally fall into two categories, those of "stock" and "flow". Stock measures gauge the relative claim on firm value held by debtholders while flow ones measure whether a firm can meet its fixed payments.

For the most part, the measures of leverage which have entered the literature are of the stock variety, or balance sheet based measures. The broadest measure of such is the ratio of total liabilities to total assets and while this measure is very easy to calculate, it has the weakness of including non-debt items such as accounts payable as liabilities, so it may actually overstate leverage. Another measure related to this metric, and one which Frank and Goyal employed in different forms, is the ratio of debt (short-term and long-term debt) to total assets, which also has the advantage of simplicity in calculation. However, it also assumes that all assets of the company are available to offset debt related liabilities, which is not the case since many of them are linked to specific assets. Yet another iteration of this basic measure is the ratio of total debt to net assets, which has the advantage of not being affected by trade credit, but is negatively affected by the fact that net assets can be affected by transactions that do not impact debt and so it is not a good proxy for debtholders' claims on the assets of the firm.

Given the weaknesses inherent in these measures, and the idea that their arguably greatest advantage is their ease of calculation, the most appropriate stock measure, and one which has gained a lot of traction in the practitioner world, is probably the ratio of total debt to capital (capital is defined as total debt + shareholders equity), as this better proxies for debtholders' claims against the value of the debt. Capital can either be calculated based on its book value or market value, depending on the author's preference, however, it is important to recognize that there are pros and cons associated with both approaches. For example, if you use the book value of debt and equity, many argue, you may not be using the best gauge of the current value of the firm since these values are based on historical cost accounting. Also when using book value, several manual adjustments need to be made to a company's balance sheet in order to calculate an accurate ratio, which makes it difficult to analyze large quantities of data as it typically done in capital structure research. For example, deferred taxes often should be reclassified as equity instead of debt (if the company is growing), the same in certain instances as convertible debt (if the conversion option is deep in the money). Still, one can argue that using the book value of these accounts, especially equity, has the advantage of lower volatility in the value of the firm, making it a more conservative approach.

On the other hand, if you use the market value of capital, while you may have the advantage of quantifying the most up-to-date value of the firm, as per Agha (2013), the value can be very susceptible to market swings and as such, unreliable making it, difficult to base planning objectives on, or an assessment of the probability of distress. Also, when a firm actually experiences distress, its market value tends to converge to its book value (or even drop below) and it is precisely during this time that the value of debtholders' claims on the assets of the firm take on the most meaning since they approximate any potential loss, so the basing of decisions on a market value at a given point in time, especially when the market is overvalued, can be a very risky proposition. Finally, due to data limitations, it is not practicable to calculate the market value of debt, so the denominator of the ratio will only have the market value of equity, although Bowman (1980) showed that this does not have much impact on the value of a firm.

Against this backstop, the use by Frank and Goyal of the ratio of total debt to the market value of assets represents a very reasonable and practical compromise in the quest to find the most efficient measure of leverage for academic research purposes, as it uses debt in the numerator instead of total liabilities and accounts for the market value of equity in the valuation of the firm. Also, to be conservative, Frank and Goyal also included the ratio with the book value of equity in the denominator in its research, as in the final analysis, a look at both ratios within the context of one another provides more information than just looking at one in a vacuum, an approach which Akhtar (2012) also employed while examining the role of business cycles in the variation of leverage. Nonetheless, we fully acknowledge that the use of a total debt to capital ratio would be an even better "stock" related measure and cite this as a limitation of the paper and an opportunity for future research, provided that the issues with significant manual adjustment can be addressed.

Moving on to "flow" measures of leverage, they are generally less numerous than stock measures and have been applied much more parsimoniously in research. In fact, we only discuss three here. The reason that they exist is that in contrast to stock measures, they actually gauge how much difficulty (if any) a company is having in making its payments. In other words, they convey information with respect to the probability of distress and as such, are useful tools in making risk based decisions. One of the more popular is the ratio of EBITDA (earnings before interest, depreciation and taxes) to interest expense. However, while it may tell you how well earnings plus depreciation and amortization are covering interest expense, it utilizes the income statement driven accounting convention of EBITDA to proxy for cash flow and hence, can be subject to deviation from actual cash flow. In addition, it assumes that capital does not have to be redeployed into the company's business in order to sustain it. Finally, it does not include principal payments on debt obligations, so it can be very misleading, especially for a company which is experiencing distress and cannot rollover its debt. A common variation of this ratio is the EBIT (earnings before interest and taxes) to interest expense, which address the need to replenish the capital stock of the business but also suffers from the exclusion of principal payments on debt, so clearly any improvement on these two ratios needs to somehow account for the level of debt burden that a company has. Beyond that, one can also argue that the earnings may just be a function of accrual accounting convention and not be cash producing. In addition, earnings may be subject to volatile swings in certain cyclical industries and as such, misleading, in which case average earnings over a period of years (preferably the length of the economic cycle) should be used. A third flow measure that has been operationalized is the ratio of debt to EBITDA, which is generally employed by practitioners such as Leveraged Finance bankers, and was utilized by De Maesenaire and Brinkhuis (2012) in examining the drivers of leverage in 126 European leveraged buyouts. The measure has the advantage of combining elements of both the balance sheet and income statement and hence is an improvement over the first two flow ratios discussed as it considers the principle amount of debt. However, once again, because the ratio treats the income statement driven accounting convention of EBITDA as a proxy for cash flow, the numerator can deviate significantly from cash flow available to service debt, thus causing some distortion. In addition, this definition of leverage has yet to be operationalized across a broad sample in the literature.

Now we turn our attention to a few systemic issues with respect to both stock and flow measures of leverage. As a general comment there have been suggestions that net debt or net liabilities should be used in any proxy for capital structure. Logistically, these measures would net out a company's cash balance against the debt burden, assuming that it can be used at any time to pay down debt. However, there are several issues with the logic of this approach, one being that a portion of the balance may need to be held contractually as compensating balances as part of a loan agreement with a bank. Another is that when a company is in distress and contemplating filing for bankruptcy, it typically hoards cash and seeks to "stay" all debtholder agreements, so just when a creditor needs it the most, it will be "ringfenced", making inclusion of net debt a very aggressive practice. And finally, all companies have to have some level of cash on hand to fund their everyday business, so assuming that it can all be used to pay down debt ignores this reality.

Another issue which frequently comes up is that of off balance sheet liabilities and the attendant argument that any measure of leverage is incomplete without their inclusion. While this view certainly has some validity, e.g., operating leases, probable legal settlements, etc., the problem with trying to include them is that consistent with their name, they are not reflected on the balance sheet and hence, must manually be ferreted out of the footnotes to ascertain their existence. This adds a level of complexity to the analysis of capital structure that simply makes it unrealistic to pursue, since for example, in our paper, we would have had to review the financial statements of all non-financial firms headquartered in the US from 1950-2012, a literally impossible task. Due to this non-feasibility, measures of leverage used in capital structure research often are a compromise between what is best and what is available.

A More Effect Dependent Variable

The measure in question is rooted in the concept that "cash is king," given that it is cash flow that ultimately is utilized to make contractual payments under debt instruments and not accounting earnings, which may, or may not, be concomitant with the generation of cash flow, or balance sheet equity. And so it is that measures such as net income, operating income and earnings before interest, taxes and depreciation can aid in our understanding of the earnings power and operating strength of a company, and even tell us *a bit* about cash flow, but these measures are all indirect in this regard and as such, are subject to analytical error. *A much better metric and one that is less indirect is that of "Funds from Operations", or FFO* as it is called in banking circles since it captures the essence of sustainable operating cash flow and as such, can generally be used to pay debt obligations. The ability to pay debt is often a key input into the question of whether to add leverage or not.

Technically, FFO is defined as net income + non-cash expenses + non-recurring expenses – non-cash income - non-recurring income, and often can easily be calculated by adding and subtracting the first few lines in the operating section of the cash flow statement, although if there are significant non-recurring items, a fulsome review of them is also necessary. Note, however, that it does not include working capital accounts and related changes, as those tend to vary, throwing off cash in some years but consuming it in others and as a result, cannot be counted on to generate sustainable cash flow. Besides, if they are truly "working capital" accounts, then the cash that they consume should only be *temporary*, and can be financed via draws on a company's revolver, which acts as a type of "credit card", or in the case of many larger firms, issue paper in the commercial paper market. Once the working capital accounts turn, or are reversed, the cash that is generated can be used to pay down the revolver or pay off the securities in the commercial paper market. In this regard, the FFO measure is able to elucidate for us the true underlying and sustainable cash flow generating power of a company, and as we said, this is ultimately what is needed to pay off debt, not accounting earnings.

So with FFO as context, we now have part of what we are seeking, namely a more effective explanatory variable of leverage, but again, it is only part of the story, as it doesn't tell us much about what a company's particular debt burden is, i.e., how much debt the cash flow has to service. And it stands to reason that the more debt that the cash flow has to service, the riskier the cash flow is "levered", as is said in Finance, and with that the greater the firm's relative credit risk. Conversely, the lower the debt, the less levered the cash flow and with that, the lesser the comparative credit risk. So how do we get this? In order to capture a company's specific debt burden, all we have to do is simply take total debt from its balance sheet and, to finalize our "new" metric, divide the company's FFO by that level of total debt, or TD, expressing the result as a percentage. The higher the percentage, the lower the relative debt burden, or leverage, as it is called, and the lower the credit risk, all else being equal (note: as debt-financed assets generally have useful lives greater than a year, the measure is not meant to gauge whether annual FFO covers debt fully, e.g., a ratio of 1 or 100%, but rather, does it have the capacity to service debt within a prudent timeframe, i.e., a ratio of 0.4 or 40%, which implies the ability to service debt fully in 2.5 years).

And so with this as context, we now submit that our newly introduced leverage metric is inherently more efficient than traditional metrics, for it is a *combination of entries from the cash flow statement and balance sheet*, whereas traditional metrics like Total Debt/Market Value of Assets are based entirely on the balance sheet (although it does use the market value of capital instead of the book value, these still are balance sheet based accounts). As a result, we believe that our metric should tell a more fulsome story with respect to capital structure decisions and therefore be of innately more explanatory value. We also note that a combination balance sheet/cash flow metric to proxy for leverage has already been extensively utilized in the practitioner world, for example by the major rating agency Standard & Poor's, which uses the FFO/Debt ratio in its rating analysis and Leveraged Finance bankers, who typically employ a more easily calculated version of this ratio known as Debt/EBITDA to benchmark the risk and appropriate pricing of transactions.

However, before we move onto a synopsis of the testing of our thesis, first we must cover a few programming notes. To begin with, please note that for presentation purposes within the context of this paper, in which we compare the relative efficiency of two leverage measures, we use the reciprocal form of FFO/TD, or TD/FFO, to put the comparison with TD/MVA on an equal footing. In other words, we make the directionality of each proxy the same, meaning that a higher number means more leverage in the capital structure while a lower number means less leverage, or less risk, otherwise we would have the confusing scenario in which the amount of leverage meant one thing in one instance and another for the other, e.g., a high number for the traditional proxy meant high leverage, while a high number for the new one meant low. As such, please keep this in mind when reviewing the results.

Secondly, please notice that we also include a slightly modified version of the FFO/TD proxy in our analysis, for which we swap out total debt for long-term debt and report the results side-by-side with the original one. There is a good reason for this. Some analysts only use long-term debt in their leverage analyses because ostensibly, the source of repayment for short-term debt is not funds from operations, but rather, the conversion of working capital accounts (receivables and inventory, offset by payables) into cash. Therefore, including short-term debt in the denominator could potentially overstate the levering of the cash flow and as such, the relative leverage it represents. In reality, companies often mix the sources of funding used to pay down long-term and short-term debt, so one could argue that this is a reasonable theoretical point not supported by actual practice. Regardless, we include the modified version in our analysis for those who would prefer to see it, as we recognize its potential significance. But the main thrust of our thesis utilizes the version that includes total debt, as this treatment is both defensible and more importantly for this paper, matches the one used by Frank and Goyal (2009).

DATA DESCRIPTION

The purpose of this study is three-fold: (i) to introduce a more robust measure that proxies for capital structure, (ii) to compare the explanatory power of the new proxy of capital structure with prior proxies used in the existing literature, and (iii) to update the period used in prior capital structure papers to contemporary times to ensure their continued robustness. Regarding part (i), robust scholarly works from Akhtar (2012), Frank and Goyal (2009), Leary and Roberts (2005), Rajan and Zingales (1995), Harris and Raviv (1991), Titman and Wessels (1988) and Myers (1984) all suggested and used similar measures to assess firm's capital structure, all of which were based on the balance sheet, e.g., debt/capital. However, in this paper we deviate from that norm by introducing a measure that considers both the cash flow generating ability of a firm as well as the balance sheet. Specifically, in this paper, we benchmark our results for this new measure to those of Frank and Goyal (2009).

As such, analogous to their original work, the sample in our study consists of firms that are headquartered in the United States during the time period of 1950 to 2012[2]. Data for these firms were obtained mainly from COMPUSTAT. Financial firms are excluded from the final sample. Also, we checked COMPUSTAT footnote code to eliminate firms with code AB, just as Frank and Goyal (2009) had done, bringing total firm annual observation to 294,693. The variables used in the analyses were winsorized at the 0.50% level at both tails of the distribution.

Dependent Variable

In capital structure literature, leverage and its alternative forms are used as proxies. Typically in these studies, leverage has been defined in terms of asset coverage of a firm's total debt, utilizing a balance sheet focus. However, here in our study, we skew paradigmatically from the traditional leverage proxies and introduce a new measure of capital structure grounded in firms' cash flow statements. This is because debt can be a cheap way to expand the size of the company as long as the firm has enough debt capacity to take on the obligation, however, debt can also result in financial distress if the company is unable to repay the debt according to its agreed schedule. With this in mind, it is ultimately a firm's cash flow which is utilized to make contractual payments under debt instruments and not equity and/or accounting earnings which may, or may not be associated with the generation of cash flow.

Therefore, we believe that a much better metric and one that captures the availability of cash to repay debt is one which we call funds from operations. Why is this? Because funds from operations captures the essence of sustainable operating cash flow and as such, can generally be used to pay debt obligations. And as noted, a combination balance sheet/cash flow metric to proxy for leverage has already been extensively utilized in the practitioner world, for example by the major rating agency Standard & Poor's, which uses the FFO/Debt ratio in its rating analysis and Leveraged Finance bankers.

Technically, it is defined as net income + non-cash expenses + non-recurring expenses – non-cash income – non-recurring income, and often can be calculated by adding and subtracting the first few lines in the operating section of the cash flow statement (to the extent that non-recurring income and expenses are not material). Note, however, what it does not include, namely working capital accounts and related changes, as those tend to vary, throwing off cash in some years but consuming it in others and as a result, cannot be counted on to generate sustainable cash flow. As a result, cash that they consume should only be *temporary*, and can be financed via draws on a company's revolver, which acts as a type of "credit card", or in the case of many larger firms, issue paper in the commercial paper market. Once the working capital accounts turn, or are reversed, the cash that is generated can be used to pay down the revolver and/or pay off the securities in the commercial paper market, with the net effect of the two transactions being $0. In this regard, the funds from operations measure is able to capture for us the true underlying and sustainable cash flow generating power of a company, free from temporary effects,

For the purposes of this paper, we construct the following equation from COMPUSTAT to define funds from operations (FFO):

$$FFO = NI - XIDO + DP - SPPIV + TXDC + RCP \tag{1}$$

From FFO and consistent with the measures of debt used in extant literature, we consider two alternative measures of leverage: (a) the ratio of funds from operation to total debts (FTD) and (b) the ratio of funds from operations to long-term debts (FLD). Intuitively, these measures suggest that the higher the ratio the better, since that means there is a greater amount of FFO to cover the debt. However, for the purposes of this research, such ratio interpretation would be different compared to the existing literature proxy for capital structure, which use debt in the numerator of their leverage measures. As such, in compliance with prior literature, we utilize the reciprocal of FTD and FLD[3], which places debt in the numerator and FFO in the denominator. Hence, like total debt to firm's total asset, the higher values in our measures of capital structure suggest a more highly levered, or aggressive position[4], while the lower values are associated with a less levered and hence, more conservative position. While we test two reciprocal variables as dependent variables, FTD1 and FLD1, we consider FTD1 to be the focal dependent variable, as it is a total debt ratio, consistent with that employed by Frank and Goyal (2009).

Figure 1 depicts the annual average movement of the nominal values of the inputs used to comprise the primary leverage ratios used in this analysis, namely the market value of firms' total assets (MVA), which is used in the primary Frank and Goyal proxy, funds from operations (FFO), which we introduce here as part of our new proxy, and total debt (TD), which is utilized in both the traditional analyses and ours. While the three variables all have basic upward movements, the movements of TD and FFO seem to mirror each other more closely than that of MVA, which has increased at a significantly more rapid pace beginning in the 1980's. Thus, the similarity in the pattern exhibited by mean TD and mean FFO could infer that the prior proxy of the firm's capital structure was either suboptimal or misspecified.

FIGURE 1
THE RELATIONSHIP OF MARKET VALUE OF TOTAL ASSETS (MVA) AND FUNDS FROM OPERATIONS (FFO) TO FIRMS DEBTS (TD)

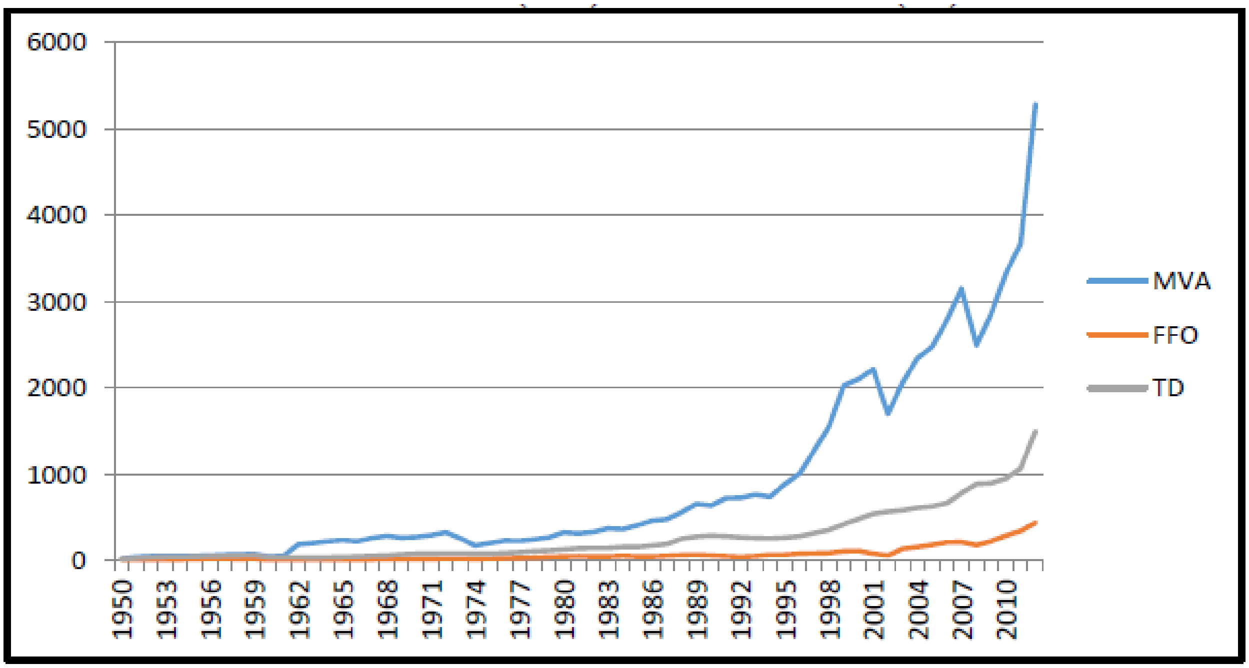
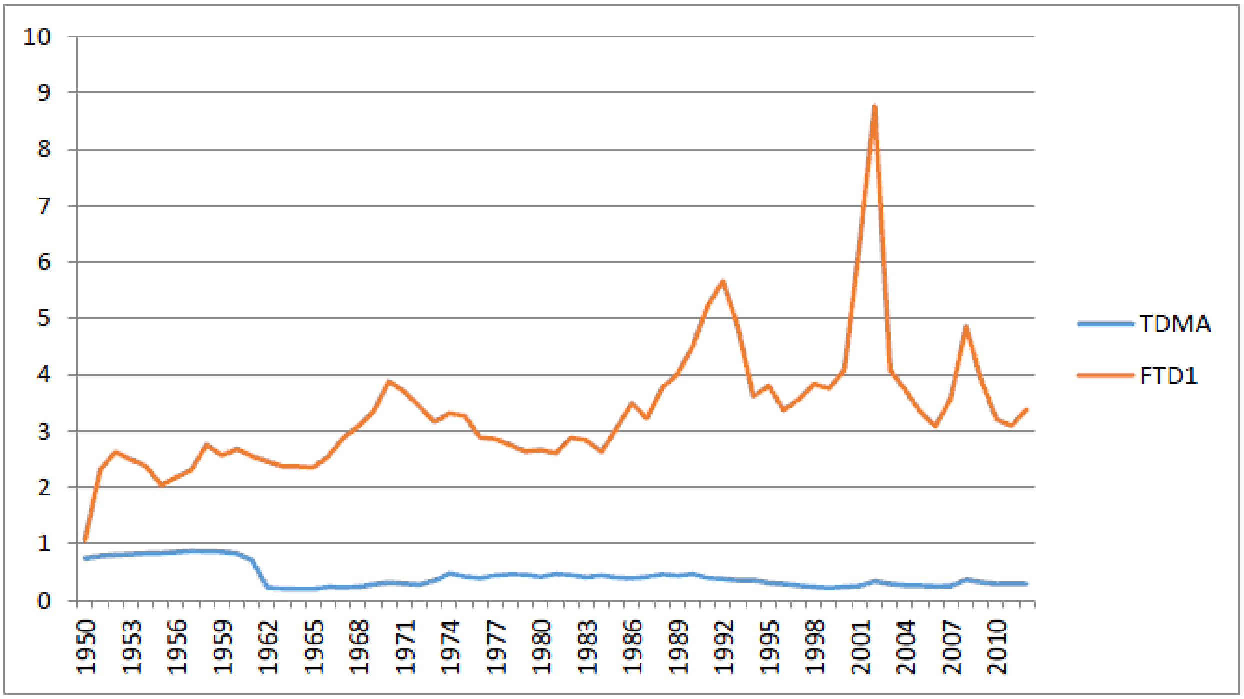


Figure 2 reveals the annual mean movement of our two primary leverage proxies. As stated, TDMA is the proxy used in the existing literature while, FTD1 is this paper's focal ratio.

From Figure 2, we can see that total debt to market value of assets (TDMA) seems to have a downward trend suggesting that leverage has become more conservative over time. However, unlike TDMA, funds from operation to total debt reciprocal (FTD1) values suggest an upward trend in leverage, meaning that usage of debt relative to cash flow capacity has been increasing. So as can be seen, depending on which proxy is used, the historical trend in leverage differs quite substantially, i.e., while with one it appears to be going down, with the other it is actually increasing.

Also, from Figure 2, we see that TDMA seems less volatile in comparison, with firms' highest levered position being around 87% in 1957 and lowest levered position around 20% in 1964, while FTD1 ranges from a low of 100%, or 1x in 1950 to 900%, or 9x in 2002. A detractor to this traditional ratio then is that at least on the surface, the market cyclical behavior of leverage is not captured as effectively as with the newly deployed one.

FIGURE 2
COMPARISON: LEVERAGE PROXIES OVER TIME



Independent Variables

In the literature, many independent variables have been introduced and tested as factors that affect firm's capital structure/leverage decisions, with a virtual compendium of such testing being undertaken by Frank and Goyal (2009). Specifically, the authors identified six independent variables from a total list of twenty-five to be the most important determining factors of capital structure for US firms, median industry leverage, market to book ratio, tangibility, profits, log of assets, and expected inflation. Together, these six core factors account for about 27% of the variation in leverage in firms' capital structures in their study, whereas the remaining 19 variables only account for only an additional 2%. As such, in this paper, our primary objective is to assess the contributory impact of these six core factors on the new measure of capital structure that we introduce, FTD1, and then compare its computed explanatory power to that of the traditional metric used by Frank and Goyal (2009), setting up a "head to head" competition, so to speak.

As a programming note, please be aware that the six core factors used in this paper are the exact ones used by Frank and Goyal (2009) with the exception of expected inflation, which we have replaced with the average US monthly Treasury bill rates obtained from the Center for Research in Security Prices (CRSP), which Frank and Goyal (2009) themselves suggested in their original paper was unlikely to alter the results.

Descriptive Statistics

Table 1 provides the descriptive statistics of the three dependent variables that we test in this paper, the traditional TDMA measure, our newly introduced FTD1 and a version of the newly introduced variable called FLD1 (with the only difference being this version only considers long-term debt) as well as the six independent variables, or core factors already mentioned. The median value (30.06%) of TDMA is below its mean value (40.25%), as are the FTD1 and FLD1 median values (119% and 69% respectively) below their mean values (229% and 187% respectively). However, the distribution among the capital structure proxies reflects a large cross-sectional difference between firms at the 10^{th} percentile range where, for example, a value of -1.9836 for FTD1 is observed, to firms at the 90th percentile rang, where FTD1 increases to 8.3941, thereby resulting in a much larger spread than FLD1 or TDMA.

TABLE 1
NON-FINANCIAL AND NON-REGULATED US FIRMS FROM 1950 - 2012

				Distribution		
Variable	N	Mean	SD	10th	50th	90th
Dependent Variables						
TDMA	271,989	0.4025	0.3671	0.0000	0.3006	1.0000
FTD1	243,507	2.2882	4.4998	-1.9836	1.1868	8.3941
FLD1	224,284	1.8674	3.3247	-0.5315	0.6929	6.5968
Independent Variables						
ILev	294,693	0.2184	0.1298	0.0562	0.2141	0.4121
Tang	272,659	0.3255	0.2466	0.0462	0.2639	0.7396
MB	204,858	1.6845	1.5815	0.5311	1.0652	3.8732
Profit	270,896	0.0515	0.2226	-0.2455	0.1131	0.2445
TB	294,693	0.0496	0.0263	0.0118	0.0501	0.0846
Size	274,628	4.1575	2.2270	1.1256	4.0631	7.3970

Furthermore, FTD1 and FLD1 both had negative values at their 10th percentile range, implying that firms in this lower percentile had negative cash flow and thus, great difficulty in paying any maturing debt obligations. This disparity is naturally highlighted in the high standard deviation values exhibited by these proxies, for instance, the standard deviation to mean value for FLD1 is about 2 times (4.4998/2.2882) the mean value. Like the explained variables, most of the explanatory variables' mean values were higher than their median values except average monthly Treasury bill (TB), for which its median (mean) value is 5.01% (4.96%). Profitability (Profit) had a negative value for firms in the 10th percentile suggesting firms in that percentile were not profitable, which also could explain the aforementioned negative values with respect to funds from operations. This relationship is also evident in the correlation matrix presented in Appendix B, which shows a strong correlation between funds from operations and firm profitability. When viewing the appendix, please note that beside each correlation, the star indicates statistical significance at the 99% level.

METHODOLOGY AND RESULTS

To examine the capital structure behavior of firms in our sample, we estimate three related models differing in time period examined, with each model capturing a unique feature of that behavior. The first equation empirically investigates the behavior of firm's capital structure within the same period as the factors, or contemporaneously. The second equation investigates whether prior levels of the factors impact capital structure decisions, with the independent variables being lagged by one year (capital structure papers are replete with the models similar to equation 2). And finally, the third model (equation 3) looks at whether changes in the core factors affect changes in the capital structure, offering insight beyond the absolute levels of the factors explored in the first two equations. These models are expressed as follows:

$$Lev_{it} = \alpha + \beta_1 ILev_{it} + \beta_2 Tang_{it} + \beta_3 MB_{it} + \beta_4 Profit_{it} + \beta_5 Size_{it} + \beta_6 TB_{it} + \varepsilon_{it} \qquad (2)$$

$$Lev_{it} = \alpha + \beta_1 ILev_{it-1} + \beta_2 Tang_{it-1} + \beta_3 MB_{it-1} + \beta_4 Profit_{it-1} + \beta_5 Size_{it-1} + \beta_6 TB_{it-1} + \varepsilon_{it} \qquad (3)$$

$$\Delta Lev_{it} = \alpha + \beta_1 \Delta ILev_{it} + \beta_2 \Delta Tang_{it} + \beta_3 \Delta MB_{it} + \beta_4 \Delta Profit_{it} + \beta_5 \Delta Size_{it} + \beta_6 \Delta TB_{it} + \varepsilon_{it} \quad (4)$$

where *i,t, t-1, and* Δ represent firm, year, one year lag, and change (difference from one year lag to current year) respectively. We look at the three definitions of capital structure mentioned above, the traditional one, the one we introduce here, and then a slight variation of the newly introduced one. Industry Median is the median of total debt to market value of assets by industry. Industry is defined as the Fama-French 48 Industry classification. Treasury bill is the average monthly Treasury bill. Tangibility is the ratio of net property, plant, and equipment to firm's book asset. Market to Book ratio is the ratio of market value of assets to book value of assets. Profitability is the ratio of earnings before interest, taxes, depreciation and amortization to book value of assets. Size is the log of book value of assets.

We begin by performing ordinary least square regressions on pooled cross-sectional data, however, for purposes of robustness, we declare our data as panel and expand the findings with firm and time fixed effect regressions in all three models, thus addressing any "invariant" omitted variable bias associated with industries and years. The regression results are reported in tables 2, 3, 4, and 5.

Question 1: Do current events in factor variables influence Firm's capital structure?

The literature on capital structure tends to focus on the contribution of prior events to a firm's present mix of debt and equity, however we begin our analyses by looking at the contemporaneous impact, assuming that current events in factors' behavior could influence the capital structure of firms. As such, Table 2 present regressions with capital structure proxies as the dependent variable. Columns 1 to 3 are pooled regression models for our sample universe. Columns 4 to 6 are pooled regression for the sample universe ending in 2003[5]. Columns 7 and 8 are fixed effect regression models. We use a firm-year fixed effect model.

The results shows that the six factor variables identified by Frank and Goyal (2009) are all statistically significant when using their focal dependent variable, TDMA. While this might be expected, we run the regression models using TDMA to assess the consistency and directionality of the factor variables and also, to help validate the usage and robustness of the introduced variables as we evaluate their explanatory power. As envisaged, we find that the directionality holds in all regression models that had TDMA as its dependent variable (that is, columns 1, 4, and 7). However, beyond replication, our goal is to introduce a new leverage proxy to assess firm's capital structure, and hence, we argue that this variable – FTD1 - is more robust when examining capital structure decisions, as it elucidates the true position of a firm's ability to pay their debts. Accordingly, we expect that the coefficient of determination which is the R squared will be higher for FTD1 than TDMA, which in essence, is the crux of our paper.

Also in Table 2, we find that the R-squared are higher for FTD1 regressions compared to TDMA regressions. For instance, in columns 4 and 5 which represent regression models with observations to 2003, the factor variables explain about 42% variance in FTD1, whereas, these factors only explain about 32% variance in TDMA, a material difference which underpins our thesis that total debt/funds from operations is a more efficacious proxy. However, more significantly, when we control for fixed-firm and year effects and extend the data sample to 2012, the level of explained variance drops to 25% for TDMA, while it remains at 42% for FTD1.

Additionally, we estimate the impact of the factor variables over time on FTD1, on a decade-by-decade regression basis, starting in the 1960's and ending with the 2010 to 2012 stub period. The results are shown in Table 3. We do not perform this test for the 1950s decade because the sample size was smaller than 100 observations. Over the decades, some of the factor variables were not statistically significant and directionality changed. For instance, Treasury bill (TB) directionality changed in the 1980 decade and was not statistically significant in the 1970 and 1990 decades. The highest explanatory power for the six factor variables was in 2000 to 2009 which they accounted for about 44% variation[6], while the lowest was from 1970-79, when it was 28%. However, the result is supported by the fact that the R-squared is over 40% for each decade since 1980.

TABLE 2
DO CURRENT BEHAVIOR OF FACTORS IMPACT FIRMS' CAPITAL STRUCTURE?

	TDMA	FTD1	FLD1	TDMA	FTD1	FLD1	TDMA	FTD1
	1	2	3	4	5	6	7	8
ILev	0.4259***	0.3753***	0.5354***	0.4143***	0.4401***	0.6317***		
Tang	0.1651***	0.4746***	1.0980***	0.1543***	0.4770***	1.1053***	0.1985***	0.6631***
MB	-0.0624***	-0.1665***	-0.2483***	-0.0697***	-0.1530***	-0.2302***	-0.0452***	-0.1492***
Profit	-0.2383***	-6.3753***	-11.9510***	-0.2463***	-6.4295***	-12.1634***	-0.2327***	-5.7192***
Size	0.0105***	0.0523***	0.0916***	0.0120***	0.0510***	0.0907***	0.0242***	0.0459***
TB	0.9073***	1.6613***	2.6876***	0.8952***	0.1999	0.5222^{+}	0.4938***	1.5459***
_cons	0.1532***	-0.3267***	-0.3885***	0.1675***	-0.2457***	-0.2566***	0.1652***	-0.3357***
FE	no	no	no	no	no	no	yes	Yes
N	203,683	178,977	164,921	166,373	149,337	139,290	203,683	178,977
R2	0.3033	0.4181	0.3866	0.3177	0.4174	0.3916		
Adj R2	0.3033	0.418	0.3866	0.3177	0.4174	0.3915		
Overall R2							0.2525	0.4171

TABLE 3
TRENDS OF FACTORS IN DECADES

	1960-69	1970-79	1980-89	1990-99	2000-09	2010-12
ILev	1.0888***	0.2391***	0.7574***	0.3773***	-0.1626*	0.0656
Tang	0.1961**	0.5192***	0.5610***	0.5599***	0.3516***	0.4280***
MB	-0.1605***	-0.2071***	-0.1256***	-0.1299***	-0.2075***	-0.1172***
Profit	-7.3347***	-6.1932***	-6.1732***	-6.8625***	-6.4595***	-6.3560***
Size	0.0022	0.0326***	0.0263***	0.0797***	0.0783***	0.1186***
TB	5.7573***	0.4246	-0.7900*	-0.2643	2.3582***	
_cons	-0.1045	-0.0478	-0.2726***	-0.4095***	-0.2890***	-0.8446***
N	10,069	31,546	42,031	47,325	39,774	8,214
R2	0.3045	0.2803	0.4138	0.4236	0.4386	0.4031
Adj R2	0.3041	0.2802	0.4137	0.4235	0.4385	0.4028

Question 2: Do past movements in factor variables affect firms' capital structure?

To investigate information carryover from prior years, we lag the factor variables for a year, with the results being reported in Table 4. Like Table 2, Table 4 shows that the factor variables explain about 31% variation for FTD1 pooled regression – that is, column 2. When comparing this to the Frank and Goyal (2009) capital structure proxy – TDMA, we find that the factor variables explain only about 26% variation in firm's capital structure in columns 1 and 4[7], hence the newly introduced proxy once again exhibits greater explanatory power in this analysis, although less than when the variables are contemporaneous. Unlike TDMA, which is about the same for the time periods ending in 2003 and 2012, with respect to FTD1, the sample ending in 2003 had a slightly higher explained variation than for the entire sample model ending in 2012, although the magnitude only was about 2%[8]. Interestingly, when we perform a firm and year fixed effect regression, of which the results are reported in columns 7 and 8 we see that the already higher explanatory power of FTD1 vis-à-vis TDMA, increases significantly, as the coefficient of determination for FTD1 jumps to 41% while essentially staying flat for TDMA at 27%.

TABLE 4
EFFECT OF PRIOR MOVEMENT IN FACTORS IMPACT ON FIRMS' CAPITAL STRUCTURE

	TDMA	FTD1	FLD1	TDMA	FTD1	FLD1	TDMA	FTD1
	1	2	3	4	5	6	7	8
ILev	0.4534***	0.4586***	0.6818***	0.4490***	0.5328***	0.8104***		
Tang	0.1599***	0.2352***	0.6416***	0.1494***	0.2268***	0.6173***	0.1938***	-0.6980***
MB	-0.0545***	-0.0969***	-0.1284***	-0.0614***	-0.0847***	-0.1089***	-0.0457***	0.1507***
Profit	-0.2335***	-5.1118***	-9.3570***	-0.2408***	-5.0921***	-9.3405***	-0.2276***	5.8481***
Size	0.0095***	0.0307***	0.0541***	0.0099***	0.0307***	0.0532***	0.0246***	-0.0437***
TB	1.1198***	1.9162***	3.2341***	0.9083***	0.4140*	1.0684**	0.5757***	-1.4354***
_cons	0.1418***	-0.3393***	-0.4426***	0.1708***	-0.2702***	-0.3398***	0.1594***	0.3210***
FE	no	no	no	no	no	no	yes	yes
N	186,995	165,036	152,326	151407	136,683	127,675	187,768	165,377
R2	0.2624	0.3123	0.2781	0.2632	0.2943	0.2664		
Adj R2	0.2623	0.3123	0.2781	0.2632	0.2943	0.2664		
Overall R2							0.2661	0.412

Question 3: To what extent is the change in firms' capital structure affected by changes in factor variables?

Once again, for robustness and validation purposes, we investigate the effect of *changes* in the factor variables to *changes* in the capital structure proxies. In estimating the regression model, we adjust for erroneous estimation for the OLS estimates. Hsiao (1985) suggests that the ordinary least squares (OLS) estimation of equation (1) would result in biased coefficients because ε_i is not directly observable and could be correlated with other regressors in the model. Furthermore, the correlation of dependent variable lagged one year with the error term would result in inconsistent estimates of coefficients. To overcome these problems, we take the first differences of the variables and thereby eliminate time-invariant fixed effects (ε_i). The results in our analyses are reported in Table 5. Like prior regression models, the FTD1 models reported in columns 2 and 5 have higher coefficient of variation[9]. While the changes in the factor variables account for about 12% variation in TDMA, they account for almost 17% in FTD1. Thus, we conclude that FTD1 is more robust than TDMA[10] in this instance, too, making it a better proxy for capital structure decisions.

TABLE 5
EFFECT OF CHANGES IN FACTORS ON FIRMS' CAPITAL STRUCTURE

	TDMA	FTD1	FLD1	*TDMA*	*FTD1*
	1	2	3	4	5
Tang	0.1805***	0.6207***	1.1950***	0.1773***	0.6685***
MB	-0.0327***	-0.0805***	-0.1266***	-0.0321***	-0.0802***
Profit	-0.1857***	-5.1807***	-10.4332***	-0.1873***	-5.1467***
Size	0.0509***	0.1184***	0.1169***	0.0576***	0.1068***
TB	0.5580***	0.1969	-0.0473	0.5928***	0.0404
_cons	0.0057***	-0.0302***	-0.0256***	0.0052***	-0.0293***
FE	*No*	*No*	*No*	*Yes*	*Yes*
N	183,315	156,652	142,994	183,315	156,652
R^2	0.1186	0.1677	0.1588		
Adj R^2	0.1185	0.1676	0.1588		
R^2 overall				0.1183	0.1677

CONCLUSION

In this paper, we introduce and operationalize a new measure of leverage to proxy for capital structure, the FFO/TD ratio and assess its efficiency vis-a-vis the traditional proxy, the TD/MVA ratio, postulating that the new proxy is more efficient. To demonstrate this, we rely on the six core factors identified by Frank and Goyal (2009) in their seminal work as the main determinants of capital structure and compare the power of these six factors to explain the variation in both the new and traditional proxies under a series of primary and robustness tests.

Within this context, we report that in all tests, the newly introduced leverage measure was more efficient in capturing the variation in capital structure than the traditional one by a material margin, with the headline result being that over the time period 1950-2012 using all US firms, the six core factors captured 42% of the variation in FFO/TD while only capturing 25% of TD/MVA's. As a result, we submit that our findings both advance the understanding of the determinants of capital structure as well as open the door to the potentially next logical extension of the research genre, the testing of the other factors that Frank and Goyal (2009) examined in their comprehensive analysis of determinant factors, which they did not include in their core factors due to low explanatory power. We also cite examination of the newly introduced leverage ratio with respect to the ratio of debt to capital (when practicable) as an opportunity for future research as well. As such, the contributions of this paper are multiple and relevant to a wide audience of stakeholders, including but not limited to:

- academicians researching the determinants of capital structure
- chief financial officers charged with raising capital at a competitive cost
- financial analysts analyzing the probability of firm financial distress

ENDNOTES

1. Various sources had different valuation: http://online.wsj.com/article/SB1007560548913629600.html, http://www.nytimes.com/2003/07/12/business/enron-s-plan-would-repay-a-fraction-of-dollars-owed.html, http://www.cbsnews.com/2100-201_162-562777.html.
2. Although the sample period is similar to Frank and Goyal's (2009), our sample only consists of firms that are headquartered in the US, whereas Frank and Goyal's (2009) consists of firms that are headquartered and incorporated in the US. However, this does not generate a substantive difference in our findings.
3. By reciprocal, we mean transforming the values from FFO/TD = TD/FFO.
4. While a lower value is better, a negative value reflects the lack thereof of funds to meet debt obligations.
5. This is done to compare FTD1 results with the Frank and Goyal (2009) proxy for capital structure – TDMA.
6. We do not report the decade-by-decade regression for TDMA. However, the explanatory powers of the six factor variables are lower than FTD1. Also, in comparison to Rajan and Zingales (1995) 4 factor models, FTD1 as the dependent variable had a higher variation of determination.
7. In Frank and Goyal (2009), Table V columns 1 was their pooled regression result. While their adjusted R-squared was 26.6% ours was 26.32%. We attribute the difference to the statistical software used.
8. The entire sample model for FTD1 is column 2 and the sample ending in 2003 is column 5. We subtract the difference in their explained variation 31.23% - 29.43%.
9. Anderson and Hsiao (1982) propose an instrumental variable for the dependent variable using two year lag or second difference in difference model. We repeat the regression models using two year lag and the results are still the same – suggesting that FTD1 explains firm's capital structure more.
10. Given that the factor variables explain FTD1 more broadly than TDMA, we suspect that FTD1 will also have higher explanatory power compared to other alternative measures of capital structure.

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APPENDIX A

Variable Definitions. Data source is COMPUSTAT Annual, except the Treasury bill data which is obtained from CRSP.

Dependent Variables

TDMA – is the ratio of total debt to market value of firm assets. Total debt is item 34 + item 9. Market value of firm assets is (item 199 * item 54) + item 34 + item 9 + item 10 – item 35
FTD1 – is the reciprocal of funds from operations to total debt. Funds from operation is item 172 – item 124 + item 125 – item 213 + item 126 - item 376. Total debt is item 34 + item 9.
FLD1 – is the reciprocal of funds from operations to long-term debt. Funds from operation is item 172 – item 124 + item 125 – item 213 + item 126 – item 376. Long-term debt is item 9.

Independent Variables

These are the six core variables found by Frank and Goyal (2009) that best explain variation in a firm's capital structure.
ILev (Median Industry Leverage – is the median of total debt to market value of assets by SIC code and by year.
Tang (Tangibility) – is the ratio of item 8 to item 6.
MB (Market to Book ratio) – is the ratio of market value of assets to item 6.
Profit (Profitability) – is the ratio of item 13 to item 6.
Size (Total Assets) – is the log of total assets (item 6).
TB (Treasury bill) – Annual mean was generated from daily data for the United States Treasury bill rate.

APPENDIX B

Correlation Matrix

	TDMA	FTD	FLD	ILev	Tang	MB	Profit	Size	TB
TDMA	1				0.2824*	-0.4256*	0.1164*	0.0345*	0.0795*
FTD1	-0.1021*	1			0.0294*	-0.1645*	0.6159*	0.1720*	0.0460*
FLD1	-0.0947*	0.8965*	1		0.0027	-0.1339*	0.5956*	0.1306*	0.0395*
ILev	0.3378*	0.0466*	0.0340*	1	0.4909*	-0.3027	0.2334*	0.3045*	0.0660*
Tang					1	-0.2009*	0.2065*	0.2565*	0.1188*
MB						1	-0.4420*	-0.3389*	-0.1565*
Profit							1	0.4031*	0.1114*
Size								1	-0.1517*
TB									1