Financing SMEs: a model for optimising the capital structure

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Abstract

This paper argues that the existing finance literature is inadequate with respect to its coverage of capital structure of small and medium sized enterprises (SMEs). In particular it is argued that the cost of equity (being both conceptually ill defined and empirically non quantifiable) is not applicable to the capital structure decisions for a large proportion of SMEs and the optimal capital structure depends only on the mix of short and long term debt. The paper then presents a model for optimising the debt mix and demonstrates its practical application using an Italian firm's debt structure as a case study.

Keywords: Capital Structure, Equity, Short-term Debt, Long-term Debt

1. Introduction

It is possible to distinguish two separate strands in the literature on firms' capital structure. On the one hand, there is the research rooted in Modigliani and Miller's (1958) model, which is based on the assumption of perfect markets. This stream of research focuses mainly on modelling theoretically the capital structure decision of large corporations. On the other hand, there is the empirical research on capital structure of SMEs and on SMEs lending relationships. This research tends to consider the owner and the manager of the firm as one actor and is mainly concerned with investigating how external actors (banks, trade creditors, etc.) deal with the information asymmetries resulting from the opaqueness of SMEs. Although SMEs can rely on various sources of finance such as trade credit (see for instance Rodriguez-Rodriguez, 2006), research stresses the core role played by bank finance.

Focusing on the SMEs financial structure, the present paper emphasises the importance of debt structure (that is long-term versus short-term debt) in financing SMEs and the minor role played by equity, presenting a model which is based on bank debt. In fact, we argue that SMEs should focus only on bank debt, in order to optimise their capital structure. The paper is structured as follows. Section 2 provides a review of the literature on capital structure in general and in particular on what affects capital structure decisions in SMEs. Section 3 presents the arguments that equity is inapplicable for many SMEs' capital structure decisions and that profit is not a sufficient source of finance for SMEs. In addition, the peculiar role of trade credit as a source of finance is investigated. These arguments emphasise the extremely important role of bank debt. Section 4 presents the mathematical model for determining the long-term/short-term debt mix and two examples (one real life and one theoretical) are provided. Section 5 discusses how the optimum debt mix also benefits the lender (the bank) as well as the firm. Section 6 draws conclusions and suggests some future research directions.

2. Literature Review

The most commonly used term in the literature to describe the capital structure of firms is "puzzle". It recurs in various titles of academic papers and describes effectively the problem of finding the optimal structure in financing firms and projects. The foundation of the finance literature considers theoretically the modelling of the optimal capital structure for corporations and is based on Modigliani and Miller's (1958) seminal work. Later research investigates the role of taxes (Boyce and Kalotay, 1979; Brick and Ravid, 1985), the impact of refinancing costs (Jun and Jen, 2003) and the probability of going bankrupt (Philosophov and Philosophov, 2005). Further research addresses the agency costs (Jensen and Meckling, 1976) and the moral hazard risk (Myers, 1977). The role of the cost of financing the firm is the key factor in pecking order theory (Myers and Majluf, 1984). Some scholars focus on the debt structure as a signalling device where short-term debt signals the high quality of the assets (Flannery 1986). The greater flexibility of short-term debt is also stressed (Sharpe, 1991).

The main problem with the above mentioned research and models is that they are developed by looking at organisations which can easily access equity, that is large corporations. What about organisations that are constrained in accessing finance? This is the typical situation faced by SMEs. In fact, what characterises SMEs, is the limited access to equity which arises from a number of factors. Holmes and Kent (1991), by proposing a restricted version of pecking order theory to explain SMEs capital structure, argue that

SMEs do not have easy access to equity; it is expensive and raising it implies a dilution of control of the firm. Lopez-Garcia and Sogorb-Mira (2008) by looking at Spanish SMEs find empirical support for pecking order theory and for the traditional trade off model (Kraus and Lintzberger, 1973), as well.

An additional factor which affects SMEs capital structure, is linked to the control of the firm: family are very much concerned with not losing control of the firm, in order to pass it on to the next generation of the family. Thus, such firms tend to rely more on internal financing (Lopez-Garcia and Sanchez-Adujar, 2007). Moreover, Romano et al. (2000) as well as Chittenden et al. (1996) suggest that a complex mix of social, family, cultural and financial factors influence capital structure while Kotey (1999) stresses the entrepreneurial attitudes to risk and debt.

Yet another area of the finance literature on SMEs suggests that some of the factors influencing capital structure are industry specific (Hall, et al., 2004) and country specific (Demirgüç-Kunt and Maksimovic, 1999): it is shaped by the financial market characteristics, the effectiveness of the legal system and the magnitude of government subsidies. In contrast, Psillaki and Deskalakis (2009) find that an SME's capital structure is more influenced by firms' characteristics than by the country.

Some research focuses particularly on SMEs' special features. Indeed, SMEs are (at least partially) hampered since raising finance in regulated markets is subject to constraints for small opaque firms that suffer from big information asymmetries (Berger, et al., 2001) and is impossible for the very small ones. Only as firms become older, larger and more informationally transparent, do their financial options become more attractive, accessing public equity funding as well as public long-term debt (Gregory et al. 2005). Thus, SMEs tend to rely mainly on banks (Petersen and Rajan, 1994) and on specific financing tools like leasing and factoring which facilitate them in accessing the finance they need (Beck and Demirguc-Kunt, 2006, Deloof et al. 2007).

Heyman et al. (2007) suggest that maturity matching between debt and the life of assets plays an important role in deciding the length of the debt. Short-term debt is positively correlated with a firm's growth opportunities (Garcia-Terul and Martinez-Solano, 2007): it is higher in stronger and more flexible firms, when there are big differences between short-term and long-term interest rates and when firms have more growth opportunities.

Some research investigates specifically the role short-term debt has in SMEs. It is regarded as a good tool for the bank which can act rapidly to recoup the principal on the arrival of bad news (although with the limitations pointed out by Gupta et al., 2008). It is also considered a good financing tool by entrepreneurs: they are optimistic and tend to overestimate the success of their projects, either because they receive non-economic benefits or because they fail to evaluate correctly the probability of success. Either way, from the entrepreneur's point of view, short-term debt is the best financing tool because it is perceived to be cheaper. Thus, both entrepreneur and bank prefer short-term debt (Landier and Thesmar, 2009).

Partially in contrast with the literature discussed above, which stresses the key role of banks in financing SMES, Burke and Hanley (2002) observe that banking finance is expensive and SMEs are often credit constrained. The implication of these findings is that SMEs are expected to rely more on retained earnings.

Recent empirical research on SMEs financing challenges the proposition that capital structure can be modelled by looking at agency theory, asymmetry of information, taxes, etc. In contrast with previous models, support was provided for the proposition that the determinants of short-term debt and long-term debt are different; for instance short-term debt is not affected by the trade off between tax benefits and bankruptcy costs. Long-term debt is affected by collateralisable assets but short-term debt is not (Pindalo, et al., 2006).

This was found both for SMEs and for new ventures for which the access to finance is more limited than for traditional SMEs (Örtqvist et al., 2006). Indeed, since new ventures are very risky because they lack a track record and frequently have not already entered the production and selling stage, finding a substitute for equity is very hard, notwithstanding the tax benefits linked with leveraging debt (Örtqvist et al., 2006).
Thus, the literature on SMEs suggests that any kind of generalisation can be very problematic and that optimal capital structure is not easy to determine.

3. Investigating the sources of finance for firms

Firms in general and SMEs in particular have various sources of finance to support their activities that can be summed up as:

a) equity and shareholders' funds;
b) trade credit;
c) short term and long term bank debt.

In order to develop a model to optimise the capital structure of firms, it is important to investigate the role each component has in an attempt to build up an optimal capital structure for SMEs.

3.1 The Inapplicability of Equity to SMEs Financing Decisions

In the finance literature, the optimal capital structure (i.e. debt-equity ratio) is defined as that which minimises the overall cost of financing the venture. From this perspective one needs both the cost of debt and equity. What about the role of equity in SMEs?
The literature on SMEs tends to focus on debt but does not provide a definitive answer about the role of equity. We argue that there are irresolvable problems in defining and quantifying equity and cost of equity, which prevent application of the concept of cost of equity in optimising SMEs capital structure. The problems concern determining the value of equity, what constitutes equity in an SME, how entrepreneurs consider equity and, finally, what is the cost of equity.

3.1.1 What is the Value of Equity in an SME?

In a perfect world, the value of equity is determined by the capital market. The main problem with SMEs is that there is no market where equity (that is shares representing SME ownership) is exchanged and no value can be easily ascertained. Thus, we have to look for alternative ways.
One alternative solution is to look at the financial statements. Originally, the primary role of the financial statements was that of stewardship; keeping track of what has been done with the financial resources entrusted to an enterprise's managers. There was no suggestion that the Balance Sheet 'shareholders funds' figure represented the economic value (the net present value of future cash flows) of the enterprise. In recent years however, the regulatory framework governing financial reporting has decreed that the primary role of financial statements should be to facilitate investor decisions, to enable efficient capital markets (IASB/FASB, 2006a). It is acknowledged that, ideally, investors would like to know the future cash flows attributable to the enterprise, but given the uncertainty associated with future cash flows, the shareholders' equity figure provided by the financial statements is to act as a proxy. This primary objective has guided the development of accounting standards prescribing the accounting treatment of the various items influencing

profit measurement and asset valuation and hence the shareholders' equity figure shown by the financial statements (IASB/FASB, 2006b).

There are a number of serious limitations of financial statements in providing a meaningful equity figure. Firstly, they are typically transactions based – i.e. based on historical cost rather than on market values. Even in the absence of general inflation, it is fundamental to the operation of a market economy that relative prices change in response to demand and supply conditions. Therefore, use of historical cost accounting will not reflect current asset values. Although the regulatory framework now requires that certain assets/liabilities be 'marked to market' (IASB 2009) rather than being valued at historical cost, these are assets that trade actively in markets such as common stocks and bonds – i.e. financial instruments. Financial instruments are typically a small proportion of assets for SMEs; of greater significance is the valuation of fixed assets. Companies have the option of using either historical cost or market value for fixed assets. Evidence provided by interviewing SME owners and managers suggests that the majority of SMEs use historical cost – not surprising given that market values can fluctuate wildly and may be difficult to obtain for some assets.

In addition, firms typically have many assets and liabilities that do not appear on their balance sheets but have a major impact on future cash flows: loyal customers, superior management, motivated employees, access to distribution channels, patents and trademarks and so on. Many companies acknowledge their people to be the most valuable asset. Until accountants are able to measure such assets, the book values will remain a poor proxy of the value to shareholders. An important reason why accounting profit (increase in equity per the income statement) is not the same as economic value created is that the regulatory regime effectively requires that the creation of many intangible assets is not recognised – these must be treated as an expense in the Profit and Loss account. These include (home grown) brands, marketing expenditure, intellectual capital and much of research and development expenditure. Stringent conditions allow some development expenditure to be capitalised, but the most common practice has been to treat development costs as an expense.

In addition to the problem of the exclusion of important assets, assets used in conjunction with each other often have a higher value to the firm than the sum of the values of the individual assets. That is, there are 'synergies' that are also not reflected in the financial statements. Clearly, asset evaluation impacts on reported profits and hence on "shareholders' equity" as reported in the financial statements.

An additional source of distortion in the reported profit figure is the use of historical cost accounting (as still used by the majority of SMEs). Even with relatively low inflation rates, Historical Cost Accounting (HCA) results in a number of significant problems: inflation of 2.5% per year results in a fall in the value of money of about 30% in 10 years. Where there is inflation, HCA has a number of weaknesses in terms of measuring profit (i.e. increase in equity as shown by the Balance Sheet).

Depreciation is understated, as a charge based on the historical cost of an asset does not provide for an increased replacement cost. Profit will therefore be overstated: if the resultant profit figure were to be paid as dividend to the owner/s there would be insufficient funds to replace fixed assets when necessary.

Cost of sales is understated, as the cost of replacing the stock consumed will be greater than the amount charged to the Profit and Loss account as an expense for the period. Profit will therefore be overstated: if the resultant profit figure were to be paid as dividend to the owner/s there would be insufficient funds to replace the stock and maintain the operating capacity of the firm.

In most organizations, the value of debtors exceeds the value of creditors. With inflation, the real value of debtors (an asset) falls, as does the real value of creditors (a liability). Since the value of debtors usually exceeds the value of creditors, the fall in the value of assets exceeds the fall in the value of liabilities, implying a reduction in real profits. This however is not recognised with HCA.
Borrowings (typically bank loans) are fixed in monetary terms and therefore fall in real terms with inflation, implying a gain by the company at the expense of the lender. Again, this is not reflected when HCA is used – as is usually the case with SMEs.
As well as the above factors leading to a distortion in reported profits for an individual year, the decline in the value of money means that year on year figures are not comparable. Yet the Balance Sheet figure for shareholders funds (equity) reflects the accumulation of retained profits so measured – further contributing to a meaningless shareholders funds figure!
In conclusion, therefore, although the financial statements may have their uses, providing a meaningful figure for equity, to enable the cost of equity to be determined, is not one of them.
A third possibility for valuing the equity of SMEs is to adopt the approach taken by the tax authorities in a number of countries - including the UK. Such valuations are required when shares in unquoted companies change hands (for example due to death/inheritance) and a taxable benefit arises. This approach values the firm on an earnings basis, by reference to similar quoted firms. If, for example, the annual earnings are £500k and the Price-Earnings ratio of a similar quoted company is 10, then the initial valuation of the SME will be £5m. This figure is then adjusted to reflect the fact that an unquoted company is inherently less valuable than a similar quoted company. It cannot, for example, raise capital so easily and there are often restrictions on the transfer of shares. Consequently, the £5m starting value is adjusted downwards.
Clearly, there are major limitations with this approach also. Firstly, there is the difficulty of finding a 'similar' quoted company, given the distinctive characteristics of most SMEs. Then there is the magnitude of the adjustment: should it be 10%, 25% or 50%? The figure is ultimately arbitrary and the resultant valuation is unlikely to produce an accurate representation of the true value of equity.

3.1.2 How Entrepreneurs View Equity

SMEs are traditionally financed by the entrepreneurs and their relatives (for the role of family, see Fletcher, 2000). They do not like to access external finance since it implies a reduction in the freedom in managing the firm (Delmar, 2000), limitation in the possibility of accessing non-pecuniary benefits (Jensen and Meckling, 1976) and the implementation of additional control and management tools (Delmar, 2000). SMEs are very opaque and for them the implementation of control mechanisms can be very costly. Therefore, potential investors face big problems in valuing the venture and making investment decisions (Block and McMillan, 1985). In addition, SMEs are used to dealing with banks requests rather than those of venture capitalists and business angels (Mason and Stark, 2004). Consequently, entrepreneurs do not typically seek external funds in the form of equity. As a result, in the large majority of SMEs, the equity invested in the venture consists entirely of the funds provided by the entrepreneurs.

3.1.3 What Actually Constitutes Equity?

SMEs typically have substantial debt financing but banks will require collateral that must be provided by the SMEs shareholders and associates. Therefore, the shareholders investment in the firm is not only the original cash provided plus any retained earnings, but also the personal assets provided as collateral to obtain bank funds. In other words, SMEs have hidden collateral that can play a very important role for the life of the business. In addition, when the firm is run as a sole trader or it does not rely on limited liability, it implicitly leverages all entrepreneurs' personal assets since in case of distress, creditors can access not only the firm's assets but also the entrepreneurs' private assets. Either way, shareholders and entrepreneurs usually invest in the venture all their wealth from the beginning (Avery, et al. 1998). The logical conclusion is that it is difficult to determine the real value of the equity invested in a venture since hidden equity is not included in the notional figure.
Thus, when the firm needs additional funds to expand, the original funders often are not able to provide additional equity to cover additional needs. SMEs are financially constrained in accessing additional equity and their only option is to obtain additional bank finance or leverage their trade credit capability (Berger and Udell, 1998, Howorth, 2001). The analysis provided above supports a conclusion: when SMEs need additional funds (in excess of annual earnings) to finance expansion, equity is typically not an option. Therefore, in determining the optimal capital structure of the firm, equity is not a variable but a constant and has to be treated accordingly.

3.1.4 The Entrepreneurs' View of Return on Equity

The cost of equity is an opportunity cost; the return providers of equity could earn elsewhere, on investments of a similar risk. Movements in the share price over a period of time can be used to derive this expected return on equity (ROE) – i.e. the opportunity cost of equity – for a quoted company. For most SMEs however, the ROE (cost of equity) cannot be derived from the market value of the shares.
In an ideal world, expected ROE could be derived from the firm's financial statements; competitive markets would ensure that actual ROE converged on expected ROE and actual ROE would be provided by the financial statements. As we have already argued, these statements do not provide a meaningful figure for the value of equity and hence the cost of equity.
Entrepreneurs and SME's shareholders involved in the management of the firm either directly (as managers) or indirectly (as relatives and friends of the management), seem not to pay too much attention to the expected return on equity. Literature on entrepreneurship stresses their desire for independence (Delmar, 2000), optimism about the venture's success (Landier and Thesmar, 2008) and the fact that the entrepreneurs enjoy non-pecuniary benefits as high as 20% of their investment (Moskowitz and Vissing-Jorgenssen, 2002). In fact, median entrepreneurial earnings after 10 years of business are found to be 35% less than the predicted alternative wage on a paid job of the same duration (Hamilton, 2000). From this perspective, the expected financial return on equity is not the key concern for entrepreneurs. This point is clearly supported by various interviews the researchers conducted with Italian entrepreneurs and SME managers and owners. They have difficulties in understanding the concept of return on equity: when asked to provide a figure, they first ask for an explanation and then have difficulties in providing any figure. Moreover, they are often very inconsistent when the same question is asked at different points during the interview.

3.2 Profit

Accounting profit being the change in equity, suffers from all the problems we have already listed above about equity. In addition, there are some factors that are profit specific. Pecking Order Theory (POT), as explained by Myers and Majluf (1984), stresses that profit is the first choice among the possible sources of finance, since it is the cheapest. It implicitly links profit to the cash available to the firm. Our point is that such an approach, even potentially correct in the long run, is not applicable in the short run. The problem is that profit is an accounting measure while when we discuss the sources of finance of the firm, we are interested in the cash availability to the firm.
In fact, profit differs from cash as the differences between the income statement and the cash flow statement clearly show.
Thus, profit cannot be considered the main source of finance.

3.3 Trade Credit

Trade credit is a further source of finance in addition to equity and debt. The overall amount of trade credit the firm can obtain is a matter of negotiation with the suppliers and is affected by the relative power (usually low) the SME has. The amount of trade credit is capped since it is linked to the amount of services/products the firm buys. In addition, it is strongly affected by the firm characteristics. If the firm runs the production internally and the cost of bought products and raw material is very low with respect to the overall costs the firm incurs (such as in small manufacturing firms), the role of trade credit is greatly reduced. On the contrary, if the firm outsources the production and/or the cost of raw material is very high with respect to the value of the sales (such as in the retailing sector), the firm can benefit from trade credit. In fact, firms traditionally make use of all the potential trade credit available to them.
In addition, the firm is required to provide trade credit to customers. Since the value of sales is greater than the value of the purchases, the amount of credit provided to the customers is usually greater than the amount of credit received from suppliers. As a consequence, the firm is not necessarily better off by the use of trade credit. The firm can benefit from trade credit if it is able to discount its receivables with the bank or with factoring organisation but at a cost. From this point of view, the firm is simply using a peculiar kind of bank credit.
The cost of trade credit is not easy to establish, since firms are usually not charged differently according to the length of the period for which credit is taken. Petersen and Rajan (1994) define the cost of trade credit in terms of cash discount available by paying in advance rather than utilising the full period of credit available. Such an approach provides inconsistent figures and it does not work when cash discount is not an option, where no differences in price can be found between different terms of payment. Some other works define cost of trade credit as the discount rate on discounting receivables (Miwa and Ramseyer, 2008), stressing that trade credit is an example of delegated monitoring (Diamond, 1984), where the bank exploits seller economies of scale in monitoring the buyer. Either way, the cost of trade credit is not relevant *per se*: either it is non-existent, or it is a component of the cost of bank funds (and therefore included in the cost of debt).

3.4 Implications

According to the foregoing arguments, for the large majority of SMEs, the cost of equity cannot be applied to capital structure decisions for a number of reasons:

a) SMEs are usually not listed and no market value of equity can be ascertained;
b) The book value of the equity is highly questionable and does not provide a real representation of the value of the shareholders' investment;
c) the real amount of equity is hard to determine since SMEs benefit from hidden capital in the form of guarantees provided by entrepreneurs;
d) entrepreneurs do not attach importance to the return on equity since they benefit from many other pecuniary and non-pecuniary benefits;
e) equity is not a variable but a constant since:
    a. SMEs owners do not like to open the shareholding to new investors (venture capitalists, business angels, private equity funds, etc.);
    b. SMEs owners usually invest all their wealth in the venture from the beginning and therefore when the firm needs additional finance they are not able to provide it.

Equity and the return on equity cannot be quantified or even clearly defined for the majority of SMEs. The cost of equity cannot therefore be ascertained and employed in capital structure decisions.

Also profit is not necessarily a source of finance. When, for example, the profit is the result of assets revaluation (as in mark to market accounting), profit does not generate any financial benefit. In addition, there is a time lag between earning profit and generating cash.

Finally, trade credit provided by the supplier is costless or more precisely has a cost that is embedded in the value of the product/service that is purchased. Moreover, trade credit provided by suppliers can only partially cover firm's needs since only a part of the firm's overall costs (and overall cash outflows) relate to suppliers and can be leveraged in order to gain some credit. Finally, the possibility for the firm to leverage it is strongly linked to the power it has with respect the supplier. These arguments support the point that trade credit shares characteristics with equity: its amount can be considered as given for the firm since it can change only according to change in the overall amount of products/services bought. In other words, the firm leverages all the trade credit it can and then needs other sources of finance to cover its financial needs.

According to the above reasoning, only the cost of debt is applicable to SMEs capital structure decisions.

4. The Model

The firm's financial structure can be summed as follows:

$$F = E + Rp + TC + STD + LTD$$

Where F is the total finance the firm needs, E is equity provided by shareholders, Rp is retained profit owed to shareholders, TC is trade credit provided by suppliers and STD and LTD are respectively short- and long-term debt provided by banks.

According to our arguments, E is either not quantifiable/definable or a constant and its cost cannot be determined; Rp is irrelevant since we are trying to optimise the capital structure of the firm for the short period (one year) and ambiguous (it is an accounting

measure); and TC can be considered an exogenous variable. Thus, we need to focus only on short and long-term debt.

The short-term debt is a flexible financial tool, which covers the financial needs left uncovered by other forms of financing. It is expected to be a temporary source of finance. The habitual use of short-term debt means that the firm needs financing in excess of temporary and occasional needs. In other words, when the firm uses short-term debt continuously, it transforms *de facto* short-term debt to some kind of medium/long-term debt. Theoretically speaking, the steady use of short-term debt means that the firm is not matching correctly the life of the assets and the debt used to finance them. Such a mismatch increases implicitly the firm's financial risk (Heyman, Deloof and Ooghe, 2007). Matching assets and debt correctly reduces the risk premium banks charge the firm. In addition, when the debt is consolidated into one bank, the quality of information gained by the bank improves and the bank can pass some of the savings in the cost of monitoring activity on to the customers (Moro, 2007).

The model we present here answers the question: what level of long-term debt $D \geq 0$ is optimal in the sense that the total amount of interest paid is minimised on the short period (say one year). As input data, it uses the interest rates r_L for long-term debt, r_S for short-term debt, and the reinvestment rate r_R for interest earned on positive account balance. For the model to be operationalised, we need to assume that $r_S > r_L > r_R$. In fact, the interest paid on short term deposit (i.e. what the bank pays to the provider of the funds) has to be smaller than the interest rate received by customers (who are using the funds) otherwise the bank would get less than it pays. Empirical evidence suggests that firms pay higher interest rate on short-term debt than on long-term debt. There are different possible explanations: for instance, the long term debt is often collateralised and therefore the bank is hedged in case of default. In addition, banks tend to charge short-term debt with additional management fees (that in our model are included in short-term interest rate).

If the account balance b is known for every day in the year, the total interest paid over a year can be calculated by summing up the daily interest paid for the short-term debt $b + D$ (when this is negative), subtracting the interest earned on the amount $b + D$ (when this is positive), and adding the annual interest $r_L D$ for the long-term debt. While this can be done retrospectively, the daily account balances will not be known precisely in advance, and it is sensible to specify the financial requirements of the SME by a distribution function $C(b) \geq 0$ for the account balance b, which could either be empirically derived from actual data, or heuristically derived by making assumptions about the cash flow. The distribution function is normalised according to

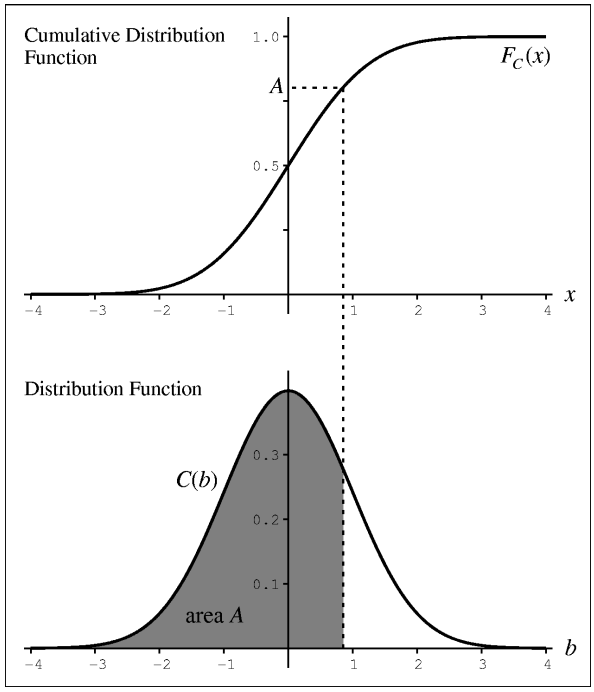
$$\int_{-\infty}^{\infty} C(b)\, db = 1.$$

The cumulative distribution function is

$$F_C(x) \quad = \quad \int_{-\infty}^{x} C(b)\, db\,,$$

which corresponds to the area to the left of x as shown in Figure 1.

Figure 1 – Normal distribution (with mean 0 and standard deviation 1) and corresponding cumulative distribution



The distribution function $C(b)$ describes how often an account balance b is available, in the sense that the integral over an interval

$$\int_{b_1}^{b_2} C(b)\,db \quad = \quad F_C(b_2) - F_C(b_1)$$

specifies what fraction of days of the year the account balance lies between b_1 and b_2, or, in other words, it gives the probability that on any given day the account balance lies within this range. In practice, there will be a minimum and maximum balance, so $C(b) = 0$ outside a certain range of values, and the integral will reduce to a finite domain, but it might be useful to allow for an infinite range, for instance to be able to use a simple normal distribution (Gaussian distribution) as a model.

The total interest I paid over a year is a function of the long-term debt level $D \geq 0$, which contributes $r_L D$ to the annual interest. Due to the long-term consolidation, the account balance is now $b + D$, so short-term debt at rate r_S is only needed if $b + D < 0$ or, in other words, if $b < -D$. On the other hand, when $b > -D$, the account balance is positive, and the SME gains interest at rate r_R. The total interest payment per year is thus

$$I(D) \quad = \quad r_L\, D \quad - \quad r_S \int_{-\infty}^{-D} C(b)\,(b+D)\,db \quad - \quad r_R \int_{-D}^{\infty} C(b)\,(b+D)\,db\,.$$

The optimal choice for the long-term debt D is the value that minimises this function. The derivative of $I(D)$ with respect to D is

$$\frac{dI}{dD} = r_L - r_S \int_{-\infty}^{-D} C(b)\, db - r_R \int_{-D}^{\infty} C(b)\, db,$$

where the two integrals are the areas under the distribution function $C(b)$ to the left and right of $-D$, representing the fraction of time the account balance is below and above $-D$, respectively. Using the cumulative distribution function F_C, this expression simplifies to

$$\frac{dI}{dD} = r_L - r_S\, F_C(-D) - r_R \left(1 - F_C(-D)\right),$$

which can be written as

$$\frac{dI}{dD} = r_L - r_R - (r_S - r_R)\, F_C(-D).$$

The minimum is obtained when this derivative is zero, hence the optimal value of D is determined by the condition

$$F_C(-D) = \frac{r_L - r_R}{r_S - r_R}.$$

This means that the optimal value of D has to be chosen such that the fraction of time the account balance falls below $-D$ equals the fraction of interest rates on the right-hand side of the equation above.
In what follows, we illustrate this result by means of two examples. The first example assumes a normal distribution for $C(b)$, the second uses actual data which had been analysed previously in Moro et al. (2009).

4.1 Example 1: Normal distribution

Consider the case when $C(b)$ is a normal distribution as shown in Figure 1, but with mean B and standard deviation σ, so

$$C(b) = \frac{1}{\sqrt{2\pi\sigma^2}}\, e^{-\frac{(b-B)^2}{2\sigma^2}}.$$

The cumulative distribution function can be expressed in terms of the error function $\mathrm{erf}(x)$ as follows

$$F_C(x) = \frac{1}{2}\left(1 + \mathrm{erf}\left(\frac{x-B}{\sqrt{2}\sigma}\right)\right).$$

To be specific, let us choose some values for the parameters. For an average balance $B = -1{,}000{,}000\,€$ and standard deviation $\sigma = 500{,}000\,€$, and interest rates $r_S = 6\%$, $r_L = 5\%$ and $r_R = 1\%$, we get $F_C(-D) = 4/5$, which gives

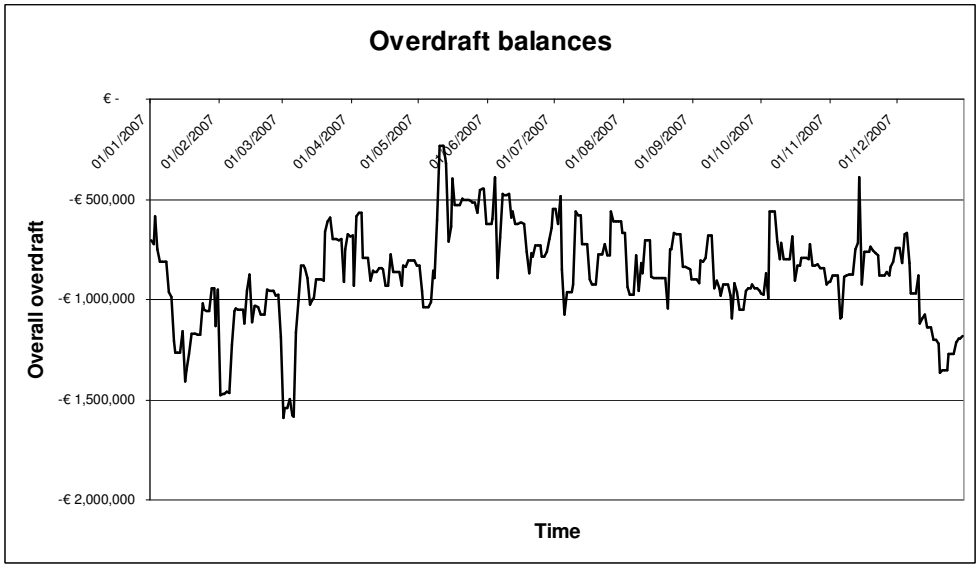
$$\operatorname{erf}\left(\frac{1{,}000{,}000 - D}{500{,}000\sqrt{2}}\right) = \frac{8}{5} - 1 = \frac{3}{5}.$$

The approximate value for the argument of the error function is 0.595115, which yields an optimum value for the long-term debt of $D = 579{,}189\,€$. The total interest paid calculates to $I(D) = 56{,}999\,€$ as compared to $I(0) = 60{,}212\,€$ which is the interest charged if only short-term debt is used.

4.2 Example 2: Empirical distribution

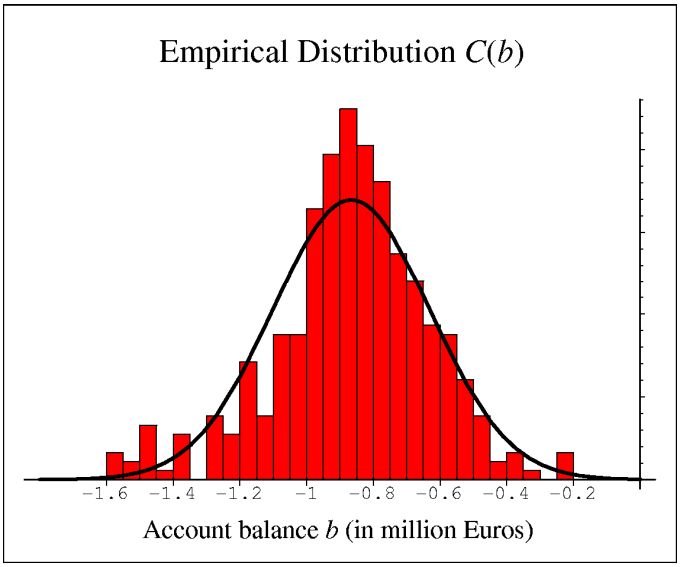
As our second example, we consider a company for which we have daily bank account data over a one year period (in fact 365 days). This example uses the data from an Italian SME and is based on the ContoCheck® model. ContoCheck® is a tool developed by an Italian financial consultancy firm, which attempts to improve the long-short term debt mix. The logic of ContoCheck® is very close to the model we presented above even though the approach is not mathematical. The daily bank balance is shown in Figure 2.

Figure 2 – Daily account balance



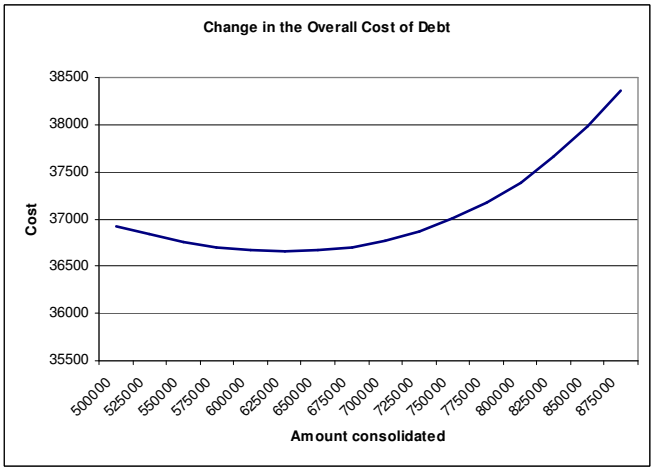
A suitable distribution function can be given as a histogram of the daily data, shown in Figure 3.

Figure 3 – Histogram of daily data and the normal distribution with the same mean and standard deviation



For the company in question, the average interest rate paid on overdraft was 4.72% and the average overdraft used around 50% of the available credit. With consolidation, the new interest rates that the firm was able to negotiate were 4.00% for the long-term loan, 4.60% for the overdraft and 0.5% on the temporary deposits. On the bases of these interests rates, the optimum long-term debt is determined by $F_C(-D) = 3.5/4.1 \cong 0.854$, so we need to find the corresponding value of the cumulative distribution function. However, since we have daily data, it is in fact simple to give a good estimate – all we need to find is the value $-D$ such that on 0.854 of the 365 days, i.e. on 312 days, the account balance was below $-D$, which can quickly be done by sorting the data. The corresponding value for D is 623,158€, which is very close to the value found in Moro et al. (2009) by locating the minimum of $I(D)$ by inspection, by looking at the graph presented in figure 3, based on use of the ContoCheck® tool.

Figure 4 – Change in the cost of credit



Alternatively, we can approximate the data by a normal distribution as shown in Figure 3. From the daily data, we obtain a mean of -865,958€, with a standard deviation of 235,307€. Using the approach of Example 1, the condition for the optimum long-term debt D is

$$\operatorname{erf}\left(\frac{865{,}958 - D}{235{,}307\sqrt{2}}\right) = 2 \times \frac{3.5}{4.1} - 1 \approx 0.7073.$$

The approximate value for the argument of the error function is 0.744056, which gives an optimum level of long-term debt of 618,355€, again in close agreement with the data obtained above. In this example, the approximation by the normal distribution, which just requires the knowledge of the mean and standard deviation of the account balance (or a reasonable estimate of these), suffices to derive an optimal debt structure.

4.3 The Debt Repayment Plan

Having determined the overall amount of short-term debt to be consolidated into long-term debt, the next step is to define the repayment plan. This has a key role in building up the optimal debt structure of the firm since:

a) if it is too short, the firm will end up again using short-term debt to finance long term assets;
b) if it is too long, it can raise problems of underinvestment since the firm has additional free cash temporarily available (Jensen, 1986).

Thus, the repayment plan has to match the cash flows available after all current expenditure (suppliers, personnel, taxes, etc.) and repayment of other long-term debt but before the payment of dividends.
The model attempts to match the life of the firm's assets and the debt maturity. The repayment plan matches the cash flows available after all current expenditure (suppliers, personnel, taxes, etc.) but before the payment of dividends.

5. Impact on Banking Relationships

Research on lending suggests that lending technologies can be grouped into four main categories: financial statement lending (based on the evaluation of information from the financial statements); asset based lending (based on the provision of collateral and its quality); credit score lending (based on statistical techniques); relationship lending (Berger & Udell, 2002). The first three lending technologies are usually defined as transaction lending because they are based on available factual and public information, independently of the quality of the relationship. They include loans that are mainly spot-like and for non recurring needs. Lenders can easily evaluate these loans using credit scoring and credit rating methods (Allen, DeLong & Saunders, 2004). Relationship lending is different from transaction lending because it is based on recurring needs (such as lines of credit, overdrafts, etc.). The research on relationship lending suggests that improvements in the relationships between banks and small businesses improves credit availability, reduces the cost of credit and the need for the pledging of collateral. In reality, the different lending technologies are not mutually exclusive. In their review of lending technologies Berger and Udell (2006) point out that banks tend to use more than one technology at a

time: relationship lending can be accompanied by the request for collateral as well as with the use of credit scoring systems.
Focusing attention on building up the best short-term/long-term debt mix can help SMEs in improving the relationship with the banks. First of all, building up the optimum short-term/long-term debt mix can reduce the adverse selection risk since the bank is provided with information about the use of the funds and has a clear idea about the capability of the firm to meet the interest and principal repayments. An additional benefit derives if the number of banks the firm is dealing with is reduced with the consolidation process (that is, when the firm decides to consolidate previous short-term debts in few/one banks). Research provides support for the proposition that such a strategy helps in reducing information asymmetry.
Secondly, optimising the short-term/long-term debt mix provides the firm and the bank with a clearer representation of financial needs: the firm has a clear idea of its financing needs; the bank is provided with information of higher quality. In fact, research emphasises the fact that different funders are interested in different aspects of the firm. Banks are focused on the cash flows that the firm generates to repay its loans (Mason and Stark, 2004). By looking at the debt mix and repayment plan for long-term debt in terms of cash flow generated by the firm, the firm offers the information the bank needs in order to evaluate the credit and to match debt maturity with the cash needed by the firm.
All these factors reduce the risk the bank incurs. When the bank operates in a lending efficient market, the benefit is passed on to the customer because the bank charges a lower risk premium to the firm. Thus, the firm-bank relationship improves and both are better off (D'Auria et al., 1999).
All in all, by optimising the short-term/long-term debt mix, not only are the SMEs better off as a result of the reduction in the cost of the funds, but also the relationship with the bank is improved. In other words, it is a win-win strategy where both SMEs and banks are better off.

6. Conclusion

In this paper we have argued that the existing finance literature is incomplete with respect to the capital structure of SMEs. Its focus is on the debt equity – mix, which we have argued is inappropriate for SMEs. The cost of equity is not applicable to the majority of SMEs capital structure decisions. Equity, although theoretically definable as the net present value of future net cash flows attributable to the owners, is not usually quantifiable: no market value is usually available and the financial statements provide a poor proxy. Although the accounting regulators are moving towards the investor decision making function of financial statements, the magnitude of the problem encountered makes it unlikely that these statements will provide a meaningful equity figure in the foreseeable future. Moreover, due to the hidden equity in the form of personal collateral provided by owners, such statements are further constrained in their ability to quantify equity. Many entrepreneurs, in addition to not knowing the value of their equity, are unable often to provide additional equity and unwilling to consider external new equity as a source of finance, as it dilutes ownership and control. Equity therefore, whatever its value, is a constant not a variable in SMEs capital structure decisions. Drawing these issues together, the implication is that SMEs should not concern themselves with the concept of cost of equity and should focus instead on optimising the debt mix. We have presented a tool for optimising this mix and thereby minimising the cost of capital. The finance literature should incorporate this approach in specifying the capital structure for SMEs. The impli-

cation of our work is to provide support for the core proposition of the Modigliani Miller capital structure model, but from a different perspective: equity/debt mix is non applicable to SMEs capital structure decisions; only the long term/short term debt mix is important.

The issues raised in this paper also have implications for a future research agenda. One area needing further consideration is the appropriateness of discounted cash flow techniques for investment appraisal in SMEs, if the cost of equity (and hence the discount rate) cannot be quantified: is it correct to use only the cost of debt? Technically speaking it is not, since in this case we are dismissing one important component in the cost of funds. In addition, it implies a strong reduction in the weighted average cost of capital since the more expensive component of the cost (equity) is ignored. Possibly, the right answer is to develop different tools in order to evaluate projects when the cost of equity cannot be quantified. Another area worthy of further consideration is the role of trade credit. It can play different roles according to industry, firm operational structure, etc. In our model it is considered an exogenous variable since we suppose that firms use all the trade credit available and then use other sources of finance. Indeed, our model looks at optimising what we can define as “the residual needs” (that is what is not covered by the available equity and trade credit). Also, the amount of trade credit can change over time, particularly when the firm suffers from seasonality.

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