Four Reasons why a New General Theory of Financial Leverage is Urgently Needed

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Abstract: *Purpose* **–** The objective of the paper is to illustrate the need for the formulation of a new general theory of financial leverage. Such a theory should embrace most of the current approaches to leverage in both academic literature and professional materials and show how they are related to each other.
Design/methodology/approach **–** The paper summarizes the conclusions coming from a critical review of the leverage literature and attempts to evaluate the size of the terminological chaos surrounding leverage. The survey results documenting the chaos among leverage concept users are also presented.
Findings – The paper formulates no less than 40 research questions, different in calibre and research status, of which some are fundamental, others are more rhetorical highlighting numerous inconsistencies which are present in the literature. The list is merely a small subset of potential queries. The link between terminological chaos surrounding financial leverage and the Global Financial Crisis, driven after all by excessive leverages, is hypothesised. Most of the controversy can be neatly summarized by a so called financial leverage paradox – a simple leverage question which may have many completely different answers, all legitimate even if not all relevant. A mistake made by Merton H. Miller in his Nobel Memorial Prize Lecture on leverage is included to illustrate the gravity of the problem.
Originality/value – The financial leverage paradox has never been defined nor debated in the literature before, Miller's mistake was never spotted by others, the list of questions documenting the size of confusion and survey results are also original.

Keywords: financial leverage, DFL, capital structure, debt

Introduction

This paper calls for a new general theory of financial leverage to be proposed. I believe such a theory is not only urgently required but it is also possible. Distinct from the fully fledged capital structure theory – still elusive, the theory of financial leverage should both address the issue of terminological chaos prevailing in the financial leverage literature, in Poland and abroad alike, as well as assist practitioners in making decisions on the capital structure of a firm/venture. The conceptual chaos in academic and professional literature (section 2) coupled with the potential damage it can cause (section 1) are two major reasons why a new theoretical framework should be attempted. In this paper I define and describe what I call a financial leverage paradox, possibly the simplest and certainly a succinct way to illustrate the potential confusion inherent in the study of financial leverage (section 3). Section 4 is

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devoted to the mistake made by Merton H. Miller in his Memorial Nobel Prize Lecture on leverage. Leaving aside the question if the mistake itself, which was not spotted by others and never corrected by the author, is the source of the chaos or it is merely an example of it (I suppose it is both), I could not have resisted to include it as the last, yet powerful source of inspiration for the work on a new theory of financial leverage.

1. Financial leverage versus the Global Financial Crisis

The Global Financial Crisis of recent years, regarded by many as the worst financial crisis since the Great Depression of the 1930s, is frequently associated with excessive indebtedness. This claim was (is) as relevant to whole states world-wide as it was (is) to single households. It characterized banks and other financial institutions as well as enterprises in a non-financial sector. In the years of globalization, the financing of imbalances, of any size and location, was never a major issue (Sławiński 2009: 34). The problem is that excessive indebtedness implies the presence of potentially lethal excessive leverage.

In the pre-crisis years, it was usually the maximization of profits that lead to large amounts of debt in and off both banking and non-financial enterprises' balance sheets. In the world where short term gains epitomized by the short term hikes in the share prices were essential to determining the size of a management bonus, any method to raise the return on equity seemed desirable.

Financiers had few problems to comprehend the simple relationship between financial leverage and (average) return on equity: the more leverage, the more (average) return. As no surprise, despite regulatory limits banks frequently managed assets 20–30 times larger than their equity (Sławiński 2009: 41). At the same time, the recommendations stemming from an equally simple relationship between the financial leverage and financial risk (the more leverage, the more risk) did not seem to be heeded by financial people with equal zeal. Yet it is the magnification of financial risk that leads to the increased (average) returns.

How is it possible to explain this one-sidedness present in the approach to risk-return dilemma shown by the practitioners? The motivation and bonus systems were certainly a part of the answer but is that everything? No doubt, greed, regulatory loopholes and outright fraud contributed to the problem too. However, is it remotely possible that top managers simply lacked basic knowledge on financial leverage? To put it differently, is it possible that higher ROE really meant superior performance to them[1]?

The hypothesis of ignorance, no matter how controversial at first glance, may not be so unwarranted given the linguistic capacity of the "leverage" term and consequently its wide (ab)use. The most trivial source of confusion comes from the fact that the term "leverage" may (in English in particular) mean both debt as well as the levered effects this debt

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[1] My many years of experience in running finance courses to executives does not certainly allow to disregard this possibility easily.

produces. Sometimes, e.g. in phrases such as "leverage, or debt" or "debt creates leverage", it is quite clear what the author of the phrase means. In most cases however the demarcation line between the two meanings is far more blurred. The challenge is best captured by a tautological, one could say, statement that "leverage creates leverage" which is perfectly clear only if both terms "leverage" are properly understood: first as debt then as leverage forces triggered by the presence of debt. The very reason for the confusion is that in most cases it not clear at all which of the two meanings is actually intended.

The wide popularity of the colloquial, after all, term "leverage" is another source of confusion. The concept is employed by both financial employees employed in corporations as well as by professional financiers working for financial institutions. It is used by academics, active in either research or education or both. The term is equally popular among non-financiers, including politicians, journalists, individual (amateur) investors, those who are responsible for their family budgets and their investment portfolios. No surprise then, that the term is bound to be understood differently by all those groups. As a result, it is not infrequent that the debate about leverage is carried out in the way that its participants talk about different leverages. Moreover, within one textbook, the term "leverage" can be used to denote different, sometimes mutually exclusive, things.

Another problem is that these days it is not financiers that determine how financial leverage should be understood. Increasingly, it is managerial accounting or accounting based financial analysis, where "leverage" plays a critical role in explaining changes in (accounting) profitability, that provide the standard for the way the concept is used. Sad as it is, financiers and finance professors seem often to take over this perspective too.

To sum up, the true question is whether the poor quality of financial education among top management was not, at least partly, responsible for excessive leverages in the pre-crisis years. The lack of full comprehension of (an ever increasing number of) financial innovations may be excused (even if it does not make it less lethal), yet the question raised here concerns the knowledge of the simplest of financial rules. It boils down to the appreciation of the gravity of the way the (financial) risk-reward dilemma was solved by Modigliani and Miller (1958, 1963). True, the MM model never attracted too much interest from finance practitioners. Its importance was frequently downplayed, whether deliberately or not is a different issue, by finance academics too. This happens every time it is its unrealistic assumptions (that apparently render the whole theory irrelevant to practice) rather than its powerful, ingenious arbitrage argument which are focused on. The work of Modigliani and Miller constitute the quintessence of finance, yet it is rarely mentioned and/or taught during accounting courses[2].

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[2] By disregarding the MM model, aren't we back to the traditional view that capital structure does not matter at all for small proportions of debt? Yet, if the foundations of MM are undermined, it means that the very logics of the model are questioned too. Why stop at small proportions? If debt does not unconditionally raise the financial risk then maybe a large proportion of debt does not raise the financial risk that much either?

The state of the "terminological confusion" surrounding financial leverage, excusable in the pre MM world (Dilbeck 1962: 127) has not been much clarified since then. If anything the confusion has deteriorated mutating into "conceptual chaos" as suggested by Żwirbla (2007: 195). Practitioners and top managers in particular could hardly escape unscathed from the ever reigning chaos surrounding the financial leverage concept, least of all they could benefit from (missing) clarity and simplicity in the academic exposition of the topic.

In a tentative attempt to confirm the hypothesis of the chaos surrounding financial leverage I have conducted a pilot internet survey among graduates and students of mostly the Warsaw School of Economics[3]. Table 1 lists 10 questions asked in the questionnaire. Four answers were available: "yes", "no", "depends", I don't know". Table 2 presents "yes" and "no" answers for the whole group surveyed and separately for those with at least three years experience in the finance profession (professional financiers).

Table 1

Survey questions

Question
1. Debt to equity (*D/E*) ratio increases from 1 to 2. Does financial risk related to leverage go up as a result?
2. The interest rate the company pays on its debt has gone up from 5% to 8%. Is the firm exposed to higher financial risk related to leverage?
3. A firm with zero coupon bonds and *D/E* = 0.4 has no interest or debt repayment in the coming years. Is the firm exposed to financial risk related to leverage in those years? Assume you are not interested in accounting-based recognition of interest payment – even if the interest is booked it is simply irrelevant.
4. A Firm's operating profit is lower than interest on its debt. Is the firm exposed to financial risk related to leverage?
5. The ungeared firm is to pay some interest on the debt it had last year. Is the firm exposed this year to financial risk related to leverage?
6. Firms A and B, both ungeared with practically no risk of bankruptcy, contemplate raising debt. Firm A estimates its *D/E* at 1 and the probability of bankruptcy at 10%. Firm B estimates its *D/E* at 2 and the probability of bankruptcy is only 3%. Is A exposed to higher financial risk related to leverage than B?
7. A firm's cash flows are big enough to cover any interest and debt repayment. Is the firm exposed to financial risk related to leverage?
8. A geared firm's stock price dropped by 20% on the bear market?with the stock exchange index also decreasing heavily. It is established that if the company was ungeared, its share price fall would have been much higher. Assuming this finding is true, was the firm actually exposed to financial risk related to leverage?
9. Firm with *D/E* = 1 has DFL = 5, meaning that a 1% change in its operating profit translates into 5% change in the net profit. Last year's DFL was merely 2 despite higher *D/E*. Is financial risk related to leverage higher this year?
10. A firm's DFL has gone down from 10 to 2. Has financial risk related to leverage decreased too?

Source: own research.

Question 1 as expected proves to be least controversial. More than 80% of respondents agree that more debt implies higher leverage (risk). However more than half of the respon-

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[3] The survey questionnaire was filled in by 56 respondents, of which 80% were or used to be economics students (2/3 had degrees in economics); 25% of respondents had at least three years experience in the finance profession.

dents believe debt amounts to matters only if it increases the risk of bankruptcy (Question 6) with less than half (44.6%) believing financial leverage exists in no bankruptcy case (Question 7). This proportion drops to a mere 30.4% when no debt related payments are to be made, with 39.3% claiming otherwise (Question 3). More than 60% of respondents agree that higher financial costs mean higher leverage (Question 2). The share drops to less than 50% if financial costs do not relate to currently held debt (Question 5). The increase in DFL implies higher leverage for more than 40% of respondents (Question 9). Interestingly, this proportion hardly changes even when this increase is accompanied by the drop in the amount of debt taken (Question 9). The answer to Question 4 is by far the most intriguing. As many as 57% of respondents do not spot leverage (risk) in the presence of negative net profit.

Table 2

Survey results

	Whole group		Professional financiers	
	"yes"	"no"	"yes"	"no"
1.	82.1	0.0	69.2	0.0
2.	62.5	16.1	46.2	15.4
3.	30.4	39.3	69.2	23.1
4.	17.9	57.1	23.1	69.2
5.	41.1	25.0	38.5	23.1
6.	55.4	21.4	69.2	69.2
7.	44.6	19.6	61.5	23.1
8.	48.2	21.4	69.2	15.4
9.	41.1	17.9	53.8	0.0
10.	42.9	16.1	53.8	15

Source: own reasearch.

The answers by professional financiers are not drastically different even if the emphasis seems to be placed differently. The financiers seem to be more cautious when it comes to linking financial leverage with the amount of debt (Question 1) and the amount of financial costs (Questions 2 and 5) – in each case more than 30% of them answer "depends", as if they were trying to say that the issue of financial leverage is more complicated than that. In other questions however their answers are more decisive than those for other respondents. More than 50% of practitioners (and less than 40% for the whole group) can see the link between leverage and DFL, even if the amount of debt changes in the opposite direction (Questions 9–10); 69% of financiers (against 48% for the whole group) spot leverage even if the market data seems to suggest otherwise (Question 8); 62% (45%) spot leverage even with no bankruptcy risk (Question 7); 69%, more than twice the proportion for the whole group (30%) – single largest difference in the opinion between the two groups, spot leverage even if debt does not lead to any payment (Question 3). Unfortunately, there is no disagreement as far as

Question 4 is concerned. Financiers fail to diagnose leverage (risk) in cases where financial costs drag profitability into the red[4].

To sum up, hardly any question shows any semblance of unanimity – more than 70% of proportions are registered only in Questions 1–2, with financiers being unable to agree on any question to such a degree. Moreover, the consistency of answers is rather low. The amount of debt is important only if accompanied with higher DFL and/or higher bankruptcy risk; however higher bankruptcy risk does not necessarily imply higher leverage. For most of the respondents leverage does not exist when the financial costs are big enough to turn operating profit into a net loss, i.e. clearly the case when the firm has (excessive?) debt and the bankruptcy may not be excluded (sic!).

It is rather immaterial if the survey results point to the complexity of the topic or they are treated as evidence of the ignorance. The objective of this simple exercise was not to determine the roots of the confusion but to merely recognize its presence.[5]

I believe a new theory of leverage is urgently needed to improve our understanding of leverage. Such a theory could not only revive the MM model but it should also illustrate how it relates to numerous other approaches to financial leverage (including those preferred by the accounting profession). Being unambiguous and simple in its core and intricate, if at all, only in the parts where interrelationship with non-finance components are explored, the theory of financial leverage should help practitioners to come back to the roots of risk-reward trade-off and consequently help them better appraise the pros and cons of debt.

2. Terminological chaos in leverage theory

The chaos mentioned in the previous section originates in the confusion present in the theory. Corporate finance theory as an independent area of research is relatively new. This is precisely the reason why "we have not yet developed one coherent theory of corporate finance" as Gruszczyński (2012: 23) rightly paraphrases the words of Tirole[6]. This is not to say that to date no considerable breakthroughs have been made in research on factors affecting enterprise value. These include macroeconomic, legal and the political environment of the corporation as well as its more endogenous factors such as: asset structure, investment project type, financial performance, management appetite for risk etc. (Błach 2009: 90–91). Some significant advances have also been made in explaining the influence of financial operations on enterprise value. This does not however change the fact that our understanding

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[4] The only way I can explain this surprising finding is by their strong attachment to DFL. When financial costs are bigger than operating profit, DFL is indeed not greater than 1.

[5] I cannot emphasize too much that the survey is merely introductory and it should not be used to formulate far reaching conclusions. Given the objective of the exercise and the small sample size, no statistical inferences were either desired or attempted. For the same reason, no conditional and cross analysis has been done.

[6] All translations of Polish authors' texts into English are made by myself.

of optimal capital structure is far from satisfactory[7]. Gruszczyński explains that "a large variety of different assumptions found in the publications in this area make this study hard and time consuming; and to make it worse it is even difficult to establish which elements of the study are truly essential". He subsequently adds that "substantial variety of models is typical to young research disciplines that tend to constantly identify new areas of inquiry" (Gruszczyński 2012: 23). What makes the issue worrying is that "a large variety of different assumptions", "substantial variety of models" and "difficulty in establishing which elements are truly essential" concern equally corporate finance as such and/or capital structure theories, which is indeed understandable, as well as even the most narrowly defined area of financial leverage, which is far less acceptable. To repeat, despite so many papers and books published over the last 50 years, no unique, generally accepted definition of financial leverage exists. Needless to say, no unique method for leverage measurement exists either.

The scale of disagreement in financial literature is massive. In Berent, Jasinowski (2012) we document it using more than 100 research papers published over 2000–2011 in leading English language finance and accounting journals. The chaos in academic textbooks and manuals is even greater. In Berent (2011) ten major questions on financial leverage lacking clear, unambiguous answers are formulated. Below I present a somewhat longer list of queries that illustrate the sources of terminological, definitional and measurement chaos. The list starts with specific inquiries and ends up with more general issues.

1. What is the relationship between various volatility/variability measures featuring in the leverage analysis? Some authors identify the results of the EPS-EBIT analysis with the DFL analysis, others equate DFL with the coefficient of variation, yet others – coefficient of variation with beta or beta with variance etc. Is it justified?
2. How is it possible to identify measures that capture the dispersion from the mean e.g. variance with measures that relate this dispersion to the mean itself e.g. the coefficient of variation, or the relative change measures such as DFL? Isn't true that some of these measures capture risk, others – the mix of risk and return?
3. What is the meaning of DFL as a measure of leverage when it is not required by its advocates that DFL > 1? Even when leverage analysis is limited to DFL > 1, is it rational to measure leverage with the index that depends on the arbitrary choice of the benchmark against which percentage changes are gauged?
4. How come the analysis of the EPS unit changes in the EPS-EBIT analysis, independent of benchmark choice, be equivalent to the benchmark sensitive DFL analysis?
5. How can the beta and DFL analysis be identical if the latter depends on the benchmark choice? Doesn't beta go up even if financial costs are zero, the case when DFL = 1?
6. Are all (numerous) formulas for DFL equivalent? Are taxes important in the DFL analysis? What financial costs, from $t = 0$ or from $t = 1$, should be used when DFL is calculated for $t = 1$ against a $t = 0$ profit benchmark?

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[7] An excellent review of existing theories of capital structure can be found in Frank, Goyal (2008) and Barclay, Smith (2005).

7. Can inequality DFL > 1 be associated with higher results for a firm with debt? Isn't it true that DFL > 1 even when those results are lower?

8. How is it possible that the neutrality of a financial leverage effect is diagnosed by the equality ROE = ROIC, when at the same it is diagnosed by DFL = 1? Doesn't DFL equal $1 + D/E$ in such a case?

9. If leverage is defined as the mechanism that inflates both profits and losses (in terms of EPS or return on capital), does the drop in profits (not in loses) resulting from financial activity imply the presence of leverage or not?

10. Can the (positive) leverage effect, defined as the surplus of ROE over ROIC, be diagnosed no matter whether the difference ROE – ROIC or ratio ROE/ROIC is used? How come if from the fact that the ratio is greater than 1 one cannot infer that ROE is greater than ROIC?

11. Does financial leverage describe systematic risk? If so, why the whole variance of rates of return, clearly the measure of total risk, goes up in leverage situations?

12. Can financial leverage be triggered by constant financial costs and at the same time measured by the standard deviation of earnings that does not change when financial costs are constant?

13. Why does the standard deviation of nominal earnings not change when debt is introduced whereas that for the rates of returns does? Does it mean that the leverage for nominal earnings does not exist? If so, why does the analysis of relative changes based on nominal earnings spot the presence of leverage?

14. Does financial leverage cease to exist as indicated by DFL = 1 when financial costs are zero? But if there is no leverage, how come that the equity return increase in such a case is interpreted as the reward for risk?

15. Is financial leverage risk all about the higher risk of bankruptcy or simply the higher volatility or both?

16. Is financial leverage present when bankruptcy is not possible? If no, how is it possible to explain the increase in rates' volatility measured by e.g. standard deviation in such cases?

17. Is it justified to identify financial leverage with a higher probability of bankruptcy and at the same time to measure it with DFL? Doesn't the probability of insolvency rise when the firm has problems with capital repayment even if it has no problem with interest repayments, or interest does not exist at all in which case DFL = 1?

18. Many textbooks derive the formula for equity beta under the assumption of risk-free debt. Is it justified in the same books to define financial leverage in terms of the higher probability of bankruptcy?

19. Is financial leverage more about higher probability of losses for the company with debt or rather about the fact that the returns for this company may be lower (not necessarily negative) than those for an all equity firm? Or is it maybe about higher distance

from the predetermined benchmark, no matter whether it is higher or lower, than for an all equity firm?

20. Is it sufficient for the existence of leverage to note that the company with debt may end up with lower returns than those made by an all equity firm?

21. Is the higher (absolute or relative) drop in a geared firm's net profitability evidence of leverage in the situation when after the drop this profitability is still higher than that for an all equity firm?

22. What about the presence of financial leverages if higher financial volatility is accompanied by stochastic dominance, i.e. more volatile returns (caused by debt) are always better than returns from an all equity firm?

23. Does there exist only one financial leverage in many disguises or many leverages of different nature? Is the magnitude of different types of leverages evidence of chaos or riches?

24. Is there any interrelationship between various types of financial leverage: income and capital leverages, accounting based and market values based leverages, EPS and ROE leverages, elasticity based and sensitivity based leverages etc.?

25. Does financial leverage analysis based on income lead to the same results as the analysis based on capital/assets?

26. Is there any difference in leverage analysis using earnings, EPS or return on capital?

27. Should financial leverage describe the levels X of profitability or the (absolute ΔX or relative $\Delta\%X$) distances between those levels?

28. How financial leverage analysis is performed with accounting data relate to leverage calculated in market values? Is the former simply a proxy for the latter?

29. Can financial leverage be good, bad or neutral, in a value neutral framework in particular? Can higher returns be tagged as good if they are merely the reward for the risk taken?

30. Does financial leverage encompass information on the company's financials only or, like in the calculations of beta coefficients, it requires data on the market too?

31. Is financial leverage all about random variables and their moments or about individual outcomes?

32. Should leverage be observed as of today ($t = 0$) or as of $t = 1$, or maybe it should be viewed as a tool in the periodic analysis from $t = 0$ to $t = 1$?

33. Why does the existence of taxes not disturb some of the financial leverage analysis results while in other types of study the results are materially changed by taxes?

34. What are the differences in the leverage analysis when debt increases a firm's size as oppose to being a part of the recapitalization?

35. Is financial leverage about the comparison of operating versus the net profitability of one firm, or is it rather about the comparison of two different firms of which only one has debt?

36. Is financial leverage triggered by debt itself or/and by the financial costs that are payable?
37. Are all capital structure or financial leverage ratios equivalent and do they all indeed describe financial leverage?
38. Is the financial leverage analysis identical with optimal capital structure research?
39. Could order within financial leverage be gained from clarifying the existing approaches or a new, all-embracing theory is indispensable?
40. Should the study of financial leverage be more about the very presence of debt or about the consequence of this presence?

A long list? By no means. The actual list is, if someone was desperate to attempt forming it, virtually endless. To be sure, the nature and research status of the questions posed above do considerably vary from one another. Some questions give real choice to the researchers, others – pointing to some internal inconsistency of the approach mentioned – are more rhetorical. What is however common in them is that they all originate from literature and can be produced as a result of an even preliminary literature review.

I believe only a completely new general theory of financial leverage could possibly provide a coherent framework to tackle all these questions, anomalies and paradoxes.

3. The financial leverage paradox

The terminological chaos can be phrased succinctly by what I call a financial leverage paradox. The paradox takes the form of a simple, innocent looking question: What would have been the change in the equity value of the geared company with a known debt-to-equity ratio if the value of an otherwise identical all equity firm increased by, say, 10%? The question does not have a unique answer. The reason for the paradox is a limitless scope for different interpretations of the question and our very ignorance of this scope.

Indeed, depending on the way the question is understood, the answers, all legitimate, may be completely different. Sometimes the question may be viewed as talking about risk, in different interpretations it is about the reward for risk, in yet other cases it can be viewed as relating to the mix of the two. In most cases, however, the answer will have no meaning at all, even if algebraically correct. In addition, some may argue that given the data available the question is not possible to answer. This interpretation is legitimate too. What is more, depending on the way the question is understood the disagreement may occur on what the missing information actually is. Paradoxically, in some interpretations, the knowledge of a debt to equity ratio is not necessary at all. In others, the scale of the analyzed change is of little importance. Some may even claim the question is unanswerable at all no matter what additional data is provided.

For example, if the 10% growth mentioned in the question describes the expected (required) change in the value of an all equity firm, i.e. it is the all equity firm's cost of capital k_E, then the question is all about the cost of the geared equity k_G, which, to reflect the risk

taken, is bound to be larger than $k_E = 10\%$, say $k_G = 20\%$. The answer is calculated with the help of the following equation: $k_G = (1 + D/\text{E}) \times 10\% - i \times D/\text{E} > k_E = 10\%$, where i denotes the cost of debt (lower than k_E). Unfortunately, based on the data available (there is no mention about i) the answer to this question is not possible.

However, if the 10% mentioned in the question describes an arbitrary shift in the value of the all equity firm from $t = 0$ to $t = 1$ denoted as r_E, then the question is no longer about the reward for risk but about the risk itself, i.e. about the change in the geared equity value r_G that corresponds to r_U. Numerically, the answer may be somewhat larger than $r_E = 10\%$, say $r_G = 11\%$, substantially larger than that, say $r_G = 100\%$, or, paradoxically, equal to 10%, or even lower than that, say $r_G = 2\%$. The value of the geared equity may not even change at all ($r_G = 0\%$) or be negative, say $r_G = -1\%$ or $r_G = -50\%$, as evidenced by the formula $r_G = r_U + D/\text{E} \times (r_U - i)$ used. Needless to say, the actual answer is not forthcoming unless the information on cost of debt i is available[8].

A 10% change does not have to describe an increase in value from $t = 0$ to $t = 1$. It may just be the information about a dispersion from the value benchmark in $t = 1$. The question then is about a percentage change in the value of the geared firm equity $\Delta\%E_{G1}$ that corresponds to a 10% change in the value of the all equity firm $\Delta\%E_{U1}$. The answer is bound to be greater than $\Delta\%E_{U1} = 10\%$, say $\Delta\%E_{G1} = 12\%$ or $\Delta\%E_{G1} = 100\%$, hence the leverage interpretation is secured as $\Delta\%E_{G1} > \Delta\%E_{U1} > 0$. One cannot provide a clear solution unless the benchmark against which the percentage change was registered. The benchmark determines not only the answer value but its meaning too. If the benchmark against which a 10% change was observed denotes the required level calculated with the help of the cost of capital k_U, then the answer to the question amounts to $\Delta\%E_{G1} = \{[(1 + D/\text{E}) \times (1 + k_U)]/(1 + k_G)\} \times 10\% > \Delta\%E_{U1} = 10\%$ and describes the risk-reward trade-off[9]. However, when the benchmark is arbitrarily chosen the link to the risk-reward analysis is severed and both the question and the answer may have little financial information content. A leverage interpretation is not lost however, i.e. the value of the geared equity will change by more than 10%. Interestingly, regardless of whether the question refers to a risk-reward trade-off or not, the ratio of the analyzed changes $\Delta\%E_{G1}/\Delta\%E_{U1}$ does not depend on the size of the change observed. In other words, the answer is identical whether the change is 10%, 20% or, say, -15%[10].

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[8] It is worth noting varying leverage credentials of different question interpretations. If it is about the cost of capital, then k_G can certainly be viewed as being levered as compared against k_U, i.e. $k_G > k_U > 0$. This however is not necessary if the question is about an arbitrarily chosen $r_U = 10\%$. In such a case, leverage in the sense that $r_G > r_U > 0$ can be spotted only if $i < 10\%$.

[9] It can be shown that the risk measure based on the percentage changes from the cost of capital driven equity values in $t = 1$ are downward biased estimators of the true risk measure based on absolute (calculated in percentage points rather than in percentages) dispersion from the benchmark in $t = 1$.

[10] The above analysis is nothing but a capital version of the classical income-based DFL study. If the 10% mentioned in the question refers to a percentage shift from an income level, then the answer is DFL × 10%. The value of DFL depends on the benchmark choice so consequently the answer may be marginally larger than 10%, say 10,001% if the benchmark is huge, moderately higher than 10%, say 20% or 30% for reasonably high benchmarks, or even close to plus infinity in cases where the benchmark is arbitrarily close to the level of financial costs. Should the benchmark be selected at levels not greater than the amount of financial costs, the answer may be positive but

When the 10% is interpreted as a 10 percentage point change in the all equity firm value from a given benchmark, then the answer is $\Delta E_G = (1 + D/E) \times 10$ p.p. regardless of the benchmark choice and whether the change takes place in $t = 0$ or $t = 1$. The size of the analyzed change is immaterial to the ratio of the observed changes, i.e. $\Delta E_G/\Delta E_U = (1 + D/E)$ too[11]. Given its numerous advantages, it is not really surprising that this result is consistent with the modern investment, portfolio and finance theory as epitomized by the work of e.g. Markowitz and Sharpe. Indeed, it can be shown that both the standard deviation (Markowitz) and beta (Sharpe) are nothing else but the generalization of the answer to the question when the 10% value change mentioned in it is interpreted as a change in percentage points. It may also be comforting to know that it is the only interpretation that secures the definite answer without any other information needed.

The financial leverage paradox as defined above has not been formulated before. Its poisonous attraction does not consist only in the fact that there are so many truly different answers to one simple question but in that the person attempting to answer it does not realize the challenge ahead of him/her and provides the answer as if his/her interpretation of it was the only one. It may even happen that the person posing the question himself/herself is not aware of the ambiguity of it. It is not uncommon that one academic textbook includes many answers to the question without even mentioning that they are all different. Unless and until one unified theory of financial leverage linking many different answers into one coherent system is formulated the confusion will not cease to exist.

4. Financial leverage and Miller's mistake

The mistake made by Merton H. Miller, a Nobel Prize laureate who wrote all his life on leverage is both the ultimate illustration of the chaos encountered in the leverage literature and at the same time a huge inspiration to start work on a completely new theory of leverage. The mistake could not have been made in a more unfortunate place and time as it did happen during Miller's Nobel Memorial Prize Lecture presented at the Royal Swedish Academy of Sciences in 1990. The mistake has never been corrected ever since as it is evidenced by the dual publication of the lecture text, first in 1991 by the Journal of Finance and then in 2005

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lower than 10% (a negative benchmark), or negative (a positive benchmark lower than financial costs) or may not even exist at all (a benchmark at the very level of financial costs). Only when the benchmark is higher than the financial costs then DFL > 1. Needless to say, the interpretation of the answer is rather limited if the benchmark does not describe the required (given the risk taken) level of profit. It should also be noticed that the scale of the analyzed change is immaterial to the value of DFL. Note also, the answer is not possibly unless the information on the benchmark is available. Moreover, it is the information on the size of financial costs rather than the amount of debt that matters. It may seem surprising but the answer is identical for any level of debt (sic!) as long as the amount of interest does not change!

[11] The answer will not change if the capital analysis is replaced with an income approach either.

by the Journal of Applied Corporate Finance, in both cases under a simple, yet much telling title *Leverage*[12]. The mistake was first noticed and analyzed in Berent (2010).

In short, during the lecture Miller uses a numerical example describing a firm with $D/E =1$, $i = 10\%$ and ROIC = 20%. He subsequently (correctly) concludes that a firm's ROE is 30%[13]. In the next step he analyzes the impact of a 25% drop in operating profitability (from 20% to 15%) on ROE concluding (again correctly) that ROE drops by as much as 33% (from 30% to 20%). The drop in net profitability is levered as it is 33% (33%/25% – 1) bigger than the drop in the operating profitability. Miller summarizes his finding: "That, after all, is why we use the graphic term "leverage" (or the equally descriptive term "gearing" that the British seem to prefer). And this greater variability of prospective rates of return to lever-aged shareholders means greater risk, in precisely the sense used by my colleagues, Harry Markowitz and William Sharpe" (Miller 2005: 108). By saying this, Miller leaves no room for doubt that the levered response to the geared equity he observes is the risk described by his co-laureates: Markowitz and Sharpe. The problem is that neither the standard deviation of returns (the measure of Markowitz) nor the beta coefficient (the measure of Sharpe) change by 1/3. The increase in both cases is 100%, as determined by $D/E = 1$. Miller seems to identify standard deviation and beta with DFL even if neither Markowitz nor Sharpe used a relative risk measure such as DFL. The frequency with which the DFL analysis is associated with beta and/or standard deviation in the literature is staggering. Is it because of Miller's authority or rather an irresistible (and fatal) attraction of the elasticity type of analysis to which Miller succumbed, and by doing so, contributed to the force of the attraction, is difficult to judge. What is more important, Miller's mistake illustrates the need for a new grand opening in leverage theory.

Conclusions

For many years now I have traced inconsistencies in the way financial leverage is defined and measured by both academics and professional financiers. I can testify to my own endless mistakes in this area. No matter how much work is done, still new traps are being identified and fallen into. Above I have formulated a list of 40 questions which document the potential perils and pitfalls. The list is but a small subsection of controversies surrounding financial leverage. With years I have increasingly grown to believe that the size of the confusion could not have been indifferent to practice. Quite the opposite. The roots of the Global Financial Crisis of recent years could probably be found in the chaos located in the academic debate. In this paper I formulate a simple question concerning the performance of the geared versus ungeared firm. The question which seems to be within the reach of

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[12] The mistake has proven to be instrumental in initiating my research on leverage. It is only hoped that this incident may help to draw broader attention to the problem and as such inspire academic discussion. If this happens, the unfortunate mistake may yet to prove quite fortunate.

[13] Miller must have assumed no taxes, the assumption he never explicitly introduces.

anybody with even a loose grasp of finance proves to be elusive and a true challenge. There are many different ones, depending on the way the question is interpreted, yet legitimate answers to it. In some interpretations the question refers to risk, in others – to risk reward, in yet others – to the mix of the two. In most cases, the answer is void of any meaning at all – even if algebraically correct. Sometimes, the question can only be answered with the help of additional data. The paradox consists in the fact that hardly anybody realizes there is a problem with this question. Most of us frequently provide answers to similar queries on leverage without even realizing that our answers do assume but one interpretation of it, in most cases this is probably not even the interpretation meant by the person asking it.

The answer to the question would be simple and intuitively attractive if one stuck to the basic ideas developed by Modigliani and Miller. However, the journey back to the MM world is no longer possible. A clear-cut relationship between various stances on leverage: income and capital leverages, market and book value driven leverages, elasticity and sensitivity based leverages, with and without tax approaches, leverages describing whole distributions or merely individual outcome etc., should be established. With so many concepts populating textbooks, professional manuals and academic journals, nothing short of a fully fledged theoretical framework, embracing as many existing approaches as possible, does suffice now.

References

Berent T. (2011), *Ten Major Questions on Leverage*, w: *Zarządzanie finansami. Współczesne wyzwania teorii i praktyki*, red. D. Zarzecki, "Zeszyty Naukowe Uniwersytetu Szczecińskiego", nr 640, Finanse, Rynki Finansowe, Ubezpieczenia, nr 38, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin, pp. 329–339.

Berent T. (2010), *Duality in Financial Leverage – Controversy Surrounding Merton Miller's Argument*, w: *Zarządzanie finansami. Analiza finansowa i zarządzanie ryzykiem*, ed. D. Zarzecki, "Zeszyty Naukowe Uniwersytetu Szczecińskiego", nr 587, Finanse, Rynki Finansowe, Ubezpieczenia, nr 26, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin, pp. 27–38.

Berent T., Jasinowski S. (2012), *Financial Leverage Puzzle – Preliminary Conclusions from Literature Review*, "Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu", nr 271, t. 1, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław, pp. 22–39.

Błach J. (2009), *Ewolucja teorii struktury kapitału*, "Finanse", nr 1, pp. 87–106.

Dilbeck H. (1962), *A Proposal for Precise Definitions of "Trading on the Equity" and "Leverage": Comment*, "Journal of Finance", vol. 17, pp. 127–130.

Frank M.Z., Goyal V.K. (2008), *Trade-off and Pecking Order Theories of Debt*, in: *Handbook of Corporate Finance. Empirical Corporate Finance*, red. B.E. Eckbo, no. 2, Handbooks in Finance Series, Elsevier, Amsterdam, pp. 135–202.

Gruszczyński M. (2012), *Empiryczne finanse przedsiębiorstw. Mikroekonomia finansowa*, Difin, Warszawa.

Miller M.H. (1991), *Leverage*, "Journal of Finance", vol. 46, pp. 479–488.

Miller M.H. (2005), *Leverage*, "Journal of Applied Corporate Finance", vol. 17, pp. 106–111.

Modigliani F., Miller M.H. (1958), *The Cost of Capital, Corporate Finance and the Theory of Investment,* "American Economic Review", vol. 48, pp. 261–297.

Modigliani F., Miller M.H. (1963), *Corporate Income Taxes and the Cost of Capital: A Correction*, "American Economic Review", vol. 53, pp. 433–443.

Sławiński A. (2009), *Przyczyny globalnego kryzysu bankowego*, w: *Nauki społeczne wobec kryzysu na rynkach finansowych*, red. J. Osiński, S. Sztaba, SGH, Warszawa, pp. 33–58.

Żwirbla A. (2007), *Dźwignia finansowa – próba krytyki oraz syntezy poglądów (artykuł dyskusyjny)*, "Zeszyty Teoretyczne Rachunkowości", z. 41 (97), SKwP, Warszawa, pp. 195–221.

CZTERY POWODY DLA KTÓRYCH POWINNA POWSTAĆ NOWA OGÓLNA TEORIA DŹWIGNI FINANSOWEJ

Cel – Celem artykułu jest wyjaśnienie powodów konieczności stworzenia nowej ogólnej teorii dźwigni finansowej. Teoria taka winna zawierać istniejące już, bardzo licznie reprezentowane w literaturze naukowej i materiałach branżowych podejścia do dźwigni finansowej, pokazując przy tym ich wzajemne relacje.

Metodologia badania – Artykuł zawiera wyniki krytycznego przeglądu literatury, którego celem jest oszacowanie skali chaosu pojęciowego w obrębie dźwigni finansowej. Wyniki własnego badania ankietowego ukazują chaos panujący wśród posługujących się tym terminem.

Wynik – Artykuł zawiera listę 40 pytań różnego kalibru i statusu badawczego. Niektóre z nich mają charakter fundamentalny i powinny otrzymać natychmiast odpowiedź, inne są pytaniami retorycznymi wskazującymi na nieścisłości obecne w literaturze. Lista stanowi jedynie niewielki odsetek możliwych pytań. Większość kontrowersji można opisać za pomocą tzw. paradoksu dźwigniowego przyjmującego postać prostego pytania o dźwignię, które to pytanie posiada liczne, często zupełnie różne odpowiedzi – choć wszystkie poprawne, to nie wszystkie istotne. Opis błędu popełnionego przez Millera w czasie jego wykładu noblowskiego poświęconego dźwigni służyć ma ukazaniu powagi zagadnienia. W pracy pojawia się hipoteza łącząca chaos terminologiczny dotyczący dźwigni z globalnym kryzysem finansowym ostatnich lat.

Oryginalność/wartość – Zarówno paradoks dźwigniowy, jak i błąd Millera nie był wcześniej ani dostrzeżony ani dyskutowany. Również badanie ankietowe, jak i lista pytań dotycząca dźwigni są wynikiem badań własnych.

Słowa kluczowe: dźwignia finansowa, DFL, struktura kapitału, zadłużenie

Citation