Finance Research Letters 22 (2017) 233–243

Contents lists available at ScienceDirect

Finance Research Letters

journal homepage: www.elsevier.com/locate/frl

A simulation on the presence of competing bidders in mergers and acquisitions

Sebouh Aintablian[a,*], Wissam El Khoury[b]

[a] *Department of Finance and Accounting, Adnan Kassar School of Business, Lebanese American University, P.O. Box 36, Byblos, Lebanon*
[b] *Department of Finance and Accounting, School of Business Administration, American University in Dubai, P.O. Box 28282, Dubai, U.A.E*

ARTICLE INFO

Article history:
Received 24 December 2016
Accepted 11 March 2017
Available online 21 March 2017

JEL classification:
G34

Keywords:
Mergers
Acquisitions
Competing bidders
Monte Carlo simulation
Brownian motion
Uncertainty
Random number generators

ABSTRACT

The current paper applies Monte Carlo simulation on the presence of competing bidders in mergers and acquisitions. We present a new approach for quantifying uncertainty and use a Brownian model where “the presence of a competing bidder” is the random variable. Our model sets its boundaries by employing physical random number generators. The calculation of boundaries enables the simulation of “certainty” about the presence of a competing bidder, and thereafter, the prediction of the geometric Brownian motion path. We use difference in country and industry as proxies for uncertainty and incorporate them into the model. By applying a sample of 3278 acquisitions we find that the slope of the geometric Brownian motion is increasing.

1. Introduction

When firms decide to enter a merger/acquisition contest, they take several factors into consideration when tailoring their bids. One of these factors, if not the most important one, is the presence of competing bidders. Bidders try to guess the true value of the target (or the object at auction) so they can accurately calculate their payoffs. However, with the presence of competing bidders, this calculation becomes more complex because it involves strategic bidding; any mistake can cause the bidder not only lose the contest, but also valuable resources such as time and money. A winning bidder can sometimes win the auction but with substantial losses that were not predicted in advance.

In order to avoid such outcomes, players can infer to quantitative methods in order to predict the existence of competing bidders. The problem related to similar methods is related to a conceptual misunderstanding: researchers have used risk measures to solve uncertainty. There is uncertainty about the presence of a competing bidder, and there is a risk of making bids based on an inappropriate uncertainty measure. Therefore, uncertainty determines risk and not the opposite (Knight (1921).[1] We shed light on this problem, explain the difference between measures of uncertainty and measures of risk, establish a link between quantum mechanics and finance (more specifically with mergers and acquisitions), and introduce a

* Corresponding author.
E-mail addresses: sebouh.aintablian@lau.edu.lb (S. Aintablian), wkhoury@aud.edu (W.E. Khoury).

[1] “*Uncertainty must be taken in a sense radically distinct from the familiar notion of risk, from which it has never been properly separated*” Knight, F. (1921). Risk, Uncertainty, and Profit. Boston, MA. Houghton Mifflin Co. (P. 19).

http://dx.doi.org/10.1016/j.frl.2017.03.002

new method for quantifying uncertainty. This new approach is based on Monte Carlo simulation which has been used before in finance for solving cases related to financial derivatives. Boyle (1977) was the first who applied Monte Carlo simulation in financial derivatives. The current paper is an application of Monte Carlo simulation on M&A auction games with an uncertainty measure (and not risk measure).

We also use a Brownian model where random variables follow a path that is a function of a Brownian motion. In our case, the random variable is the presence of competing bidders. Our model is different from the other approaches (e.g. Black and Scholes) in that we do not discard deviation (or drift) which is represented by the factor (μ), but on the contrary, we set its boundaries by employing physical random number generators. Once we establish the boundaries, we convert the stochastic equation of the Brownian model into an Itō 's integral, and thereafter, come out with a new equation for simulating "certainty" about the presence of competing bidders in M&A auctions.

In the second part of the paper we demonstrate how Monte Carlo simulation can be used to predict the presence of competing bidders. We also describe how each variable is measured and how this measurement can be derived from an uncertainty scheme. Finally, we apply the simulation empirically and test for robustness of the results. The paper is organized as follows: Section II reviews the literature on Monte Carlo methods, and on their application to mergers and acquisitions. Section III describes the theoretical model. Section IV presents the data to be tested and discusses the empirical-implementation process. Section V includes statistical tests for robustness. Section VI concludes with a summary of the paper.

2. Literature review

In general, papers that have been written on uncertainty (Papageorgiou and Traub, 1996; Detemple et al., 2003; Larcher and Leobarcher, 2001; Caselli et al., 2006, Cain et al., 2011) and on the use of Monte Carlo (Boyle, 1977; Stahl and Zimmerer, 1984; Duffie and Glynn, 1995; Paskov and Traub, (1995); Joy et al., 1996; Papageorgiou and Traub, 1996; Boyle et al., 1997; Fournié et al., 1999; Detemple et al., 2003; Larcher and Leobarcher, 2001; Chib et al., 2002; Papageorgiou, 2002; Ibáñez and Zapatero, 2004; Meinshausen and Hambly, 2004; Caselli et al., 2006; Giles, 2008; Giles et al., 2008; L' Ecuyer, 2009; Akkus et al., 2014; Bouchard and Warin, 2012) do not start from an uncertainty basis, but content to describe the procedure on running simulations and on analyzing the possible paths (Boyle, 1977; Duffie and Glynn, 1995; Boyle et al., 1997; Fournié et al., 1999; Papageorgiou, 2002; Ibáñez and Zapatero, 2004; Meinshausen and Hambly, 2004; Caselli et al., 2006; Giles et al., 2008; Giles, 2008; Bouchard and Warin, 2012). However, these paths are not driven by factors which are ruled by uncertainty measures. For instance, in merger-and-acquisition games, the bid made by a certain bidder is affected by the presence of a competing bidder. If we take "competing bidder" as a variable, it cannot be understood if not measured from an uncertainty perspective. In other words, the measures that rule out the path of the simulation are directly, if not solely, related to the measurement of uncertainty. The Brownian motion (Duffie and Glynn, 1995; Fournié et al., 1999; Papageorgiou, 2002; Giles, 2008; Giles et al., 2008) is the typical tool (or measurement) to analyze the way calculations are done, or the aspect that answers are going to take, but the idea behind defining each variable in the Brownian motion should be extended to embrace uncertainty measures and not risk measures. We believe that the challenge is not on running infinite path analyses, but on choosing the correct methods to calculate the variables present in the Brownian motion formula. For instance, we find that (μ) should be driven by concrete variables that do affect uncertainty on the presence of competing bidders (e.g. difference in country, industry, etc.). After defining the right measures, we think it would be better to use Monte Carlo (Pseudorandom sequences) and not quasi Monte Carlo (Low-discrepancy sequences): although some papers find quasi Monte Carlo to be better than Monte Carlo (Joy et al., 1996; Boyle et al., 1997; Papageorgiou and Traub, 1996; Duffie and Glynn, 1995), in our case, sequences cannot be but random; occurrence (or presence) of a competing bidder cannot be deterministic. Moreover, Larcher and Leobarcher (2001) state that quasi Monte Carlo is still not widely used and that, in many cases, it is not theoretically possible to explain its superiority.

3. The model

In this section, we provide a detailed explanation of our method, as well of the idea behind using every single formula and variable. In M&A auction games, a player (or a bidder) is uncertain if there is a competing bidder. For this, she uses the data she has in hand in order to quantify her uncertainty. This data can contain information on previous M&As, forecasts, etc. According to this information, she assigns probabilities (e.g. there's a probability of 80% for having a competing bidder, and 20% for not having a competing bidder), and adjusts these probabilities using calibrated probability assessments. If this player pays an amount to prepare her bid (costs associated with collecting information and analyzing them) and to enter the contest, then she has a risk of 20% for being wrong and losing this money. If the guess that she made is wrong, then she has to pay more money in order to set a new strategy that accounts for the presence of a competing bidder. There is difference between uncertainty and risk, and between measurement of uncertainty and measurement of risk. One should solve asymmetry of information in M&As from an uncertainty perspective, and not from a risk perspective.

In merger/acquisition games, there are players (or bidders), and each player considers the presence/absence of a competitor. For simplicity, let us assume that in case there is a competing bidder, there is only one. Before entering the contest, the first player (Player A) does not know whether a second player (Player B) has ever entered the game or not (or decided to enter). Also, in case Player B did enter, Player A does not know the value of Player B's bid. Therefore, Player A is faced to two pairs of physical properties: existence of Player B, and communication of Player B (or the bid made by player B). These