Comparison of Analytic Business Valuation
with Artificial Neural Network Synthesis

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1   Introduction

In response to the economic crisis and the dot-com bubble several economists have postulated that our ideas about market economies must change fundamentally if similar crises should be avoided in the future. These authors claimed that the recent crises occurred because investors and governments have forgotten how to measure value and how to create value by investments.[1] Especially the dot-com bubble revealed the boundaries of the relation between the valuation of a company and its share price: within months, the market capitalization of many companies multiplied due to the demand from previously non-active investors in the stock market. Other investors were attracted by the price increases of which they hoped to profit in some manner, e.g. in day-trading. The growth of the bubble was also increased by investment funds who tried to persuade their customers in view of ever-increasing profits. However, the market value of many companies was not covered by material exchange values; for example, the capital of an IT company is not manifested in material goods but in the intellectual achievements of the employees. The asset value of such a company was often not much more than a few buildings and the IT infrastructure.[2] This example makes clear that the efficient market hypothesis[3] should be discussed critically. In addition it will be discussed below that other business valuation approaches have to be considered controversial which leads to a need for a different technique for business valuation:

In recent times neural networks such as the **F**ast **A**pproximation with **U**niversal **N**eural (FAUN) approach have been used more frequently for applications in the financial industry. Time series-analyses are significant for many economical and technical applications, e. g. for forecasts of interest- or exchange rates.[4] Since important business ratios can be represented as time series the possibility exists to calculate the value of a business with FAUN. In order to demonstrate the feasibility of this approach the article proceeds as follows: In section 2 weaknesses of the classic business valuation processes are discussed in detail. Section 3 introduces FAUN and the configuration of neural networks. In Section 4 a business value

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[1] Cf. Maxton, G. (2011), p.190
[2] Cf. Fit-Gerald, K. (2010), p.64
[3] An investment theory that states it is impossible to "beat the market" because security prices fully reflect all available information.(Cf. Hirschley,M. (2003) p.30)

[4] Cf. Breitner, M.H., Köller, F., König, S., Mettenheim, H-J. v. (2007)

synthesis with the neural network FAUN will be conducted and examined. In section 5 the article is concluded with a summary and an outlook to further research.

2 Selected Business Valuation Models: An Overview

"Valuation is not an objective exercise, and any preconceptions and biases that an analyst brings to the process will find their way into value".[5] For the evaluation of the business there is no general framework which dictates special rules. The final value will always be affected by the perceptions and the personal bias of the analyst. Thus the value of a company is determined by the market: any price could be established if there are potential buyers who are willing to accept it.[6] "Valuation theory states that the true value of a business is the price at which a willing, informed but not too anxious buyer and a willing, informed but not too anxious seller will agree upon."[7] Unfortunately this event is rarely achieved, as buyer and seller are usually not equally informed and their willingness to pay is not perfectly balanced.
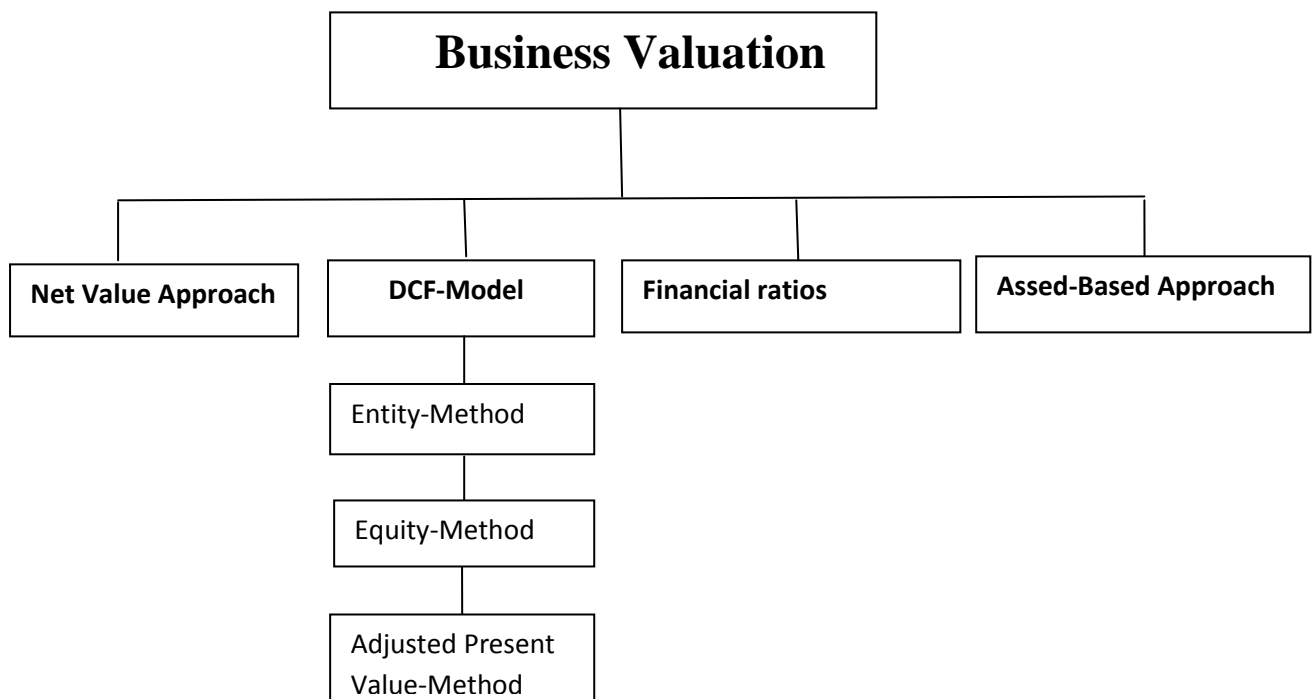

Figure 1: Overview of different Business Valuation methods[8]

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[5] Damodaran, A. (2002)
[6] Cf. Damodaran, A. (2002), p.1
[7] Hayes, G. (2009), p.229
[8] Own illustration in dependence on Linton, H.S. (2004)

In the example above FAUN was trained over the whole period of ten years and the outcome was evaluated at the end of that time period. Alternatively it is possible to successively calculate empirical models for smaller time periods.[54] In the literature it is shown[55] that there is an improvement for the results calculated with the empirical models with a smaller average deviation from the target output.

Finally, the influence of the financial measures was analyzed by omitting individual variables. A proposition for further research could be to determine the relevant interactions between the measures with a sensitivity analysis: particular input variables are changed while the others are recorded and the corresponding effect on the output is investigated.

5. Conclusion

In this contribution several business valuation methods have been analyzed and a first step towards a new way for business valuation has been examined. It was pointed out that business valuation is used for different reasons and that it is important and frequently used in practice. There is no universal framework which predetermines how the company´s valuation should be performed. There are many factors that determine the valuation – often the process is hampered by subjective influences. It was discussed in this thesis how the calculation of a business value can be performed with a neural network which is free of subjectivity. In contrast to theoretical valuation models the heuristic ANN model was employed which estimates business values from observed prices only.

A first application was performed by establishing connections between the stock price of companies and their most important financial parameters. For an example it was shown that a correlation exists between some financial parameters and the market capitalization. However, it is difficult to generalize this result because of various limitations, e.g. a quite small data base.

In the literature various applications of FAUN have been described for decision problems for which ANNs are promising. Examples are estimation and management of a credit portfolio's risk, hedging of foreign currency cashflow risks and robust optimal control of spacecraft, aircraft and missiles.[56] In the authors opinion the question whether FAUN can offer significant advantages for business valuation is a matter of further research.

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[54] Cf. Köller, F. (2002)
[55] Cf. Breitner M.H., Köller F., König S., Mettenheim H-J. v.(2007), p.485
[56] Cf. Breitner M.H., Köller F., König S., Mettenheim H-J. v.(2007, p.487