Beyond Fair Market Value

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Abstract

We begin with a brief overview of different company valuation approaches. This article presents the main functions (decision, arbitration, and argument or negotiation function) of company valuation according to the functional (i.e. purpose-oriented) theory. The main body of the article focuses on the decision function and shows how the decision value can be derived as a subjective limit value that different economic agents assign to the company. Finally, we discuss the differences between the functional and the fair market value approaches.

1 Introduction

Business valuation is the process of determining the estimated value of a business entity. It includes a detailed understanding and analysis of the business being valued, the industry in which it operates, and the local and national economic climates. A valuation performed in accordance with a fair market value standard - both an art and a science - represents the price at which a business interest would change hands between a willing buyer and a willing seller that have reasonable knowledge of the relevant facts.

However, although fair market value is the most widely standard used for dispute resolution purposes, it is not the most accurate one: it is merely a standard which (for good or for bad, mostly for bad) has become the legal standard for dispute resolution in the United States and the United Kingdom. Most notably, the fair market value standard (i) makes unwarranted assumptions borrowed from the capital asset pricing model (CAPM), and (ii) its keystone, the discounted cash flow (DCF) method is inherently open to manipulation by practitioners (like me).

In this article, we introduce the reader to the concept of *functional business valuation*, a business valuation model which aims to replicate how investors formulate investment decisions in the real world. Like in actual M&A and private equity situations, functional valuation stresses the importance of taking into account for whom the valuation is conducted and for which purpose. We discuss the valuation of a business as a whole entity or bigger-self contained parts thereof to which economic results can be assigned, in particular revenues. These economic results are thus person-and plan-dependent.

The functional business valuation concept can be applied to the purchase and sale of a business as well as to merger and business divorce situations. In these situations, conflicts between different parties, such as between buyer and seller or between partners in a merger or business divorce, are prevalent in that every party seeks to seize the maximum share of the transaction surplus.At the same time, a commonality of interests also exist regarding the will to find a transaction that will close.

This means that it is not possible to use the fair market value standard for valuation purposes of most purchase/sale or merger/divorce transactions because such fair market value simply does not exist. For example, even though market prices for listed stocks do exist, the knowledge of such market prices is not sufficient to determine whether a transactions is sensible for any party. To determine whether a transaction is sensible for one party, that party needs to know their decision value, i.e. the limit value at which the offered transaction price is acceptable. That is why buyer and sellers typically set limit prices for their transactions on stock exchanges: those limit prices should be understood as decision values. If the actual market price falls below a buyer's limit price, the buyer will buy; if it rises above a seller's limit price, the seller will sell. On a stock exchange, a transaction takes place if the actual market price lies between the buyers's and seller's respective limit prices.

Using the market price as a decision value is even more misguided when bigger blocks of shares are traded. Those cases typically resolve themselves with a negotiated price. The price per share is not necessarily the sole or most important object of such negotiations.

Likewise, in functional business valuation, we allow for a multi-dimensional decision value - as opposed to a one-dimensional decision value (limit price), reflecting the fact that a typical agreement concerning the purchase or sale of a significant interest in a closely-held business contains a lot more information than just a price. Indeed, a multi-dimensional decision value would be a very complex fair market value since, in addition to the price, it contains other, oftentimes non-monetary, components. Such a complex contract does not form at a stock exchange but is the outcome of negotiations or - in special cases - litigation. In summary, the functional business valuation concept lays the theoretical foundation for understanding conflict-prone agreement processes in imperfect and incomplete markets by defining the relevant conflict points and discussing the adequate determination of decision, arbitration, and argumentation values with a focus on the determination of the decision value.

The Great Recession has exposed the shortcomings of the fair market value approach. After all, the fair market value standard relies on concepts of capital markets theory which, in turn, rely on the idealized assumptions of perfect markets and perfect competition. In many cases, rational economic decisions concerning the acquisition or sale of a business cannot rely on the fair market value standard. Rather, such decisions need to take into account (i) the fact that most markets are imperfect, and (ii) the goals, plans, and expectations of the party for whose benefit the valuation is prepared.

Business valuation theory is often limited to describing the commonly accepted approaches (i.e. the income approach, the asset approach, and the market approach) and focuses the valuation professional's judgment on determining which approach (or combination of approaches) might be the right one. Functional business valuation denies the existence of a "right" or objective valuation. It is client-centric and, as such, relies on the client's reason for seeking a valuation. Indeed, business valuation is the process of satisfying all parties to a deal, i.e. a way to optimize the use of scarce capital.

2 Overview

2.1 Terminology

Valuation means the allocation of value to an object – the valuation object –, in most cases in the form of monetary value, by the respective valuation subject.

The *valuation subject* is the party for whom the valuation is conducted. Since the main functions of functional business valuation concentrate on interpersonal conflicts, the opposing parties representing the valuation subject are called "conflicting parties".

The *valuation object* is the thing being valued. Throughout this article we refer to the valuation object as the "business' or the "company".

Definable parts of the company are the complex divisions of the company (e.g. individual facilities, divisions, etc.) or, less frequently "shares in a company" (e.g. a block of shares or membership interests in an LLC) which can be characterized as similar to an entire business. The term "definable" is thus not limited to the spatial delimitation of part of a business, but can also mean an abstract share of an entire business.

The expression "as a whole" means that the valuation object constitutes a unique conglomerate of tangible and intangible assets (production factors). The value of this conglomerate of assets results fro the utility provision to the valuation subject. It results from the most efficient combination of these production factors. Effective management causes the whole to be more valuable than the sum of its parts, resulting in value-increasing effects (synergies, economies of scale, goodwill) which would be lost if the whole were split into its individual parts.

To recognize the positive or negative effects of a combination, a valuation must be preceded by a comprehensive company analysis (due diligence) aimed at uncovering value creation potential based on the valuation subject's views, The goal of due diligence is to assess the advantages and disadvantages , as well as risks and opportunities regarding the strategic planning for the valuation object. Therefore a business valuation needs to be embedded into the valuation subject's planning. Consequently, since it depends on the subject's planning (and, therefore, the future), the value of a business is subjective.

A value's subjectivity is an established economic concept. The value of an asset depends on a target and preference system and on the decision field of the valuation subject and their marginal utility. So, the economic term "value" is understood as a *subject-object-object relationship*, i.e. the value represents the utility which the valuation subject expects from the valuation object (during a certain time period and at a certain location) as compared to other comparable objects. This means that the valuation object has a concrete value *only* relative to a valuation subject. Therefore it cannot have a value *per se*, but only a value for somebody.

2.2 Concepts of Functional Business Valuation

Proponents of *objective business valuation* (including the fair market value standard) agree on the idea of determining the value of business independently of a concrete related party or the party seeking the valuation and on the basis of factors that could be realized by anybody. A very important aspect of objective business valuation is the concept of overcoming a conflict of interest among parties interested in the valuation by means of the independence of the appraiser. Thus, the objective of the business appraiser is at the center of the fair market value concept.

Subjective business valuation attempts to assess the value of a business by taking into account the subjective planning and ideas of the concrete party seeking the valuation. The business does not have one value as in the objective/fair market value concept, but specific values for each party interested in the valuation.

Functional business valuation integrates the subjective and objective concepts by emphasizing the *valuation purpose*. The central concept of functional valuation theory is the dependence on the purpose of the business valuation. Functional business valuation emphasizes the need to define the purpose of the valuation and its impact on the valuation. A company does not only have a specific value for each interested party but is also dependent on the purpose. Therefore, in functional business valuation each calculation has a defined purpose and should be designed iaccording with that purpose.

2.3 Functions of Business Valuation and their Value Types

Functional business valuation distinguishes between main and incidental purposes. Each function has a value type associated with it and is based on the business valuation's concrete objective. The interpersonal conflicts arising from a business change of ownership are the focal point of the main functions. Change of ownership events include not only acquisitions and sales but also events in which shareholders remain unchanged but their degree of ownership changes as a result of conflict (e.g. mergers, business divorces).

The three main functions are the decision function, the arbitration function and the argumentation function:

1. The result of a business valuation according to the *decision function* is called the company's *decision value* . In general, it is a proxy for the limit of a party's *concession willingness* in a specific conflict situation and incorporates all necessary conditions for conflict resolution among the parties (conflict-resolution-relevant issues). By extension, the decision value quantifies those extreme data points that may still be part of an agreement. In functional business valuation the decision value is the *basic value* for all main functions.

2. On the other hand, the *arbitration value* is the result of the business valuation within the scope of the *arbitration function* and is meant to facilitate agreement among the conflicting parties regarding the conditions of the change of ownership of the business under valuation. It is the value which an independent appraiser, acting as mediator, considers as a possible basis for a resolution of the conflict. The arbitration value constitutes a reasonable compromise because it does not violate the conflicting parties' decision values.

3. Finally, the *argumentation value* is the result of a business valuation according with the *argumentation function*. It represents the rationale used by one party to influence the beliefs of the other with the goal of achieving a resolution to the conflict advantageous to the arguing party. The argumentation value is a *preconceived value* and cannot be reasonably determined without one's decision value and assumptions about the opponent's decision value. Only the relevant decision values allow a party to decide which negotiation outcomes are rational and susceptible to be targeted with

a reasonable argumentation value. Thus, while the arbitration function focuses on all the conflicting parties, the decision and argumentation values concentrate on only one of the parties in conflict. Within this context, the results of the decision function constitute confidential self-information, whereas the results of the argumentation function are information directed towards the opposing party.

2.4 Systematization of Business Valuation Events According to the Main Functions

A model-theoretical analysis of business valuation problems strictly in line with its respective valuation purpose must be based on a precisely-defined starting point to allow for the proposed approach's intersubjective analysis. The valuation purpose can only be determined with respect to the valuation motive and, in turn, the valuation result must be gauged within the context of the valuation purpose and motive. Like any other value calculation, a business valuation must be *purpose-oriented* and is therefore *not* generally valid. The main functions (decision, arbitration, argumentation) describe interpersonal conflict situations, i.e. disputes about the terms under which a change of ownership may occur.

Functional business valuation is, therefore, not an equilibrium theory but a theory which considers the real world as it is: imperfect. The observed events are, consequently, decision-dependent and interpersonally-conflicting.

The events which may trigger a business valuation can be classified according to the following categories:

1. the *type of ownership change* in conflict situations (i.e. acquisition/sale, merger/divorce);

2. the *degree of relationship* in affiliated and unaffiliated conflict situations;

3. the *degree of complexity* in one- and multidimensional conflict situations; and

4. the *degree of control* in control and non-control conflict situations.

In an *acquisition/sale conflict situation*, the company's ownership to be valued changes when one conflicting party (the seller) surrenders its ownership of the company in favor of the other conflicting party (the buyer) and receives compensation (price, in the broad sense) from the buyer in exchange. The central issue in these types of transactions is usually the amount of monetary compensation (cash price) paid by the buyer.

In a *merger conflict situation*, two or more companies are combined and the ownership percentages change when the owners of the merging companies receive direct or indirect ownership interests in the new entity. In a merger conflict situation, the main topics of negotiation the distribution of future financial benefits and influence rights.

In a *corporate divorce conflict situation*, the former owners split a company into new independent companies.

The distinction between *control and non-control conflict situations* describes the balance of power between the conflicting parties regarding the change of ownership of the company under valuation. A *non-control conflict situation* is where no single conflicting party can, on its own, consummate the change of ownership: a change of ownership occurs only if the change of ownership is approved by a predetermined supermajority of owners. Although the circumstances are limited by law, regulations, foundational documents, and contractual obligations, in the case of a *control conflict situation* one of the conflicting parties may have the power to enforce a change of ownership of the company against the will of the other parties.

Most of the time, it is implicitly assumed that the decision subject evaluates a company during a conflict situation that has no relationship to other conflict situations of the type acquisition/sale or merger/divorce. Such conflict situations are defined as *unaffiliated conflict situations*. However, because it would ignore the interdependencies between conflict situations, an self-contained company valuation relying solely on one conflict situation would not be adequate if the conflicting parties sought to buy/sell and/or merge/divorce several companies. In such *affiliated conflict situations*, the company's decision value in a certain conflict situation can only be properly determined in the context of possible agreements on the other issues in conflict. In this case, the decision value is a *conditional variable*.

Business acquisitions and sales, as well as mergers and divorces, are very complex conflict situations. Indeed, agreement among the parties depends on several factors including, but not limited to, the (cash) price for the company in case of acquisitions and sales, as well as the distribution of ownership following a merger or divorce. These conflict-resolution-relevant issues form the basis for performing the business valuation under the framework of a multi-dimensional conflict situation.

3 Decision Value

3.1 Decision Value as Single and Multi-Dimensional Variable

A company's decision value is the result of a business valuation within the scope of the decision function. The term does not derive from the valuation method but rather from the purpose of the valuation.

Given the decision subject's target system and decision field, *the decision value reflects the set of conditions under which a certain action can yield the same utility value which would have been reached without that action.* Utility values are only part of the conflict-resolution-relevant issues (which affect the attainable utility values of the parties by way of the changes in the decision fields), not of the negotiation and agreement process.

In a non-control conflict situation, a rational decision subject will only consent to an agreement if its utility value is not lower than in the absence of the agreement. The decision value always quantifies the subject's marginal agreement conditions subject to the underlying conflict, i.e. it represents the subject's *concession willingness* and is, therefore, extremely sensitive, confidential information. If an agreement is reached right at the subject's decision value, the subject is indifferent between agreement and non-agreement.

In acquisition/sale-type conflict situations, the price offered to be paid for the company plays a special, if not dominant, role. This often leads to an exclusive focus on the determination of a price limit that is rationally acceptable when determining the decision value. In this case ,the decision value becomes a critical price for each party: the upper price limit (marginal price) for the buyer and the lower price limit (marginal price) for the seller. For the buyer, the decision value (its upper price limit) is exactly the price he can pay without incurring economic harm. For the seller, it is the lowest price limit he must achieve in order to avoid economic harm.

An area of agreement exists with respect to the price, P, if the buyer's upper price limit, P_{max}, is no lower than the seller's lowest price limit, P_{min}, i.e. if $P_{max} \geq P_{min}$. A transaction is advantageous to both parties if it satisfies $P_{max} > P > P_{min}$. Figure 1, below, illustrates a multi-dimensional conflict situation of the acquisition/sale type. Figure 1 combines all non-price conflict-resolution-relevant issues on the x-axis. The conflicting parties' price limits should be interpreted as conditional variables, since the buyer's and seller's limit prices are a function of them.

There are two potential areas of agreement in the example, namely the combinations of non-price factors K_3, K_4 , K_5 and K_7,K_8, where the buyer's upper price limit is higher than the seller's lower price limit. Multi-dimensional conflict situations of this type require creativity from both parties to discover potential areas of agreement.

3.2 The Marginal Price as a Special Decision Value

3.2.1 Model Basics

Regardless of the underlying conflict situation, the decision value is calculated in two steps.

The *first step* involves the ascertainment of the conflicting party's no-agreement achievable utility level (the baseline program).

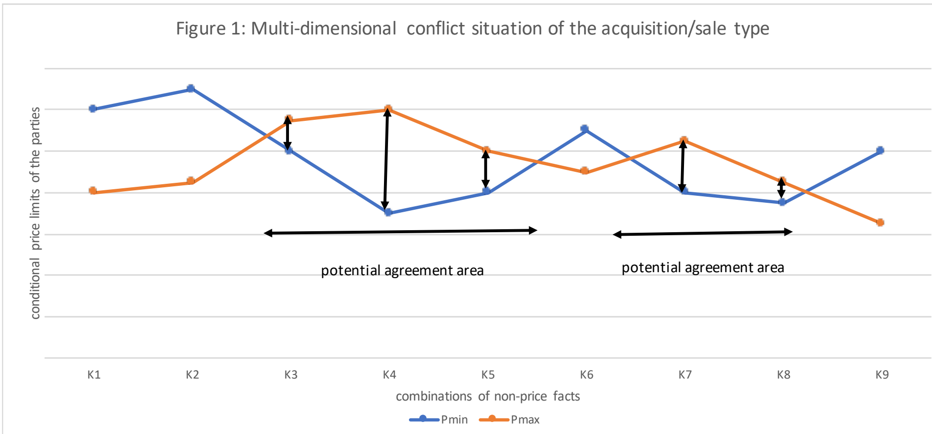
The *second step* involves the categorization of the conflict-resolution-relevant issues that a conflicting party rejects, prefers, or is indifferent to (the valuation program).

The set of conflict-resolution-relevant issues which results in the same utility level with or without agreement[1] is of special interest for the negotiating process. Indeed, this set of values composes the limit of concession willingness, i.e. the *decision value.*

Based on this concept, we can build a general decision value model from which all other decision value calculation methods can be derived.This general model requires neither the determination of the targets and decision fields nor the number and type of conflict-resolution-relevant issues as inputs. Because of its generality, this model is very complex. In order to avoid the distraction of the general model's complexity, we present in this article

[1] Or, in discontinuous cases, the lowest possible increase in utility level with and without agreement

Figure 1: Multi-Dimensional Conflict Situation of the Acquisition/Sale Type
1.pdf



a simpler model which results in an efficient algorithm for the calculation of the decision value.

3.2.2 State Marginal Price Model - A General Model

The state marginal price model is a theoretical model based on a one-dimensional, unaffiliated, non-control conflict situation of the acquisition/sale type.

The decision subject pursues a financial target, for example by maximizing time-structured distributions, and acts as an imperfect and incomplete capital market. His planning horizon is finite and extends over T periods over which investment and financial flows may take place. For the sake of simplicity, we will present the model only from the acquirer's viewpoint.

In the state marginal price model, the marginal price of a company can be calculated by linear optimization in two steps based on multi-period, simultaneous planning approaches.

In the *first step*, the investment and financing program is calculated as the baseline program. Under the assumption that there is no change of ownership, this investment and financing program maximizes the target function. The baseline program is determined by linear optimization.

The calculation of the baseline program helps the valuation subject determine the maximum utility level he can achieve without resolution of the underlying conflict; i.e. the valuation object is not included in the buyer's baseline program. Utility-maximization is achieved through financing opportunities, unlimited cash management possibilities, and the ability to make interest-bearing deposits in all periods. Liquidity must be positive at all times.

It is then possible to formulate the following mathematical model for the baseline program from the buyer's viewpoint:

Target Function:

$$EN_K^{Ba} \to max!$$

The magnitude of the distribution flow expected by the buyer from the baseline program, EN_K^{Ba}, is maximized under the following constraints:

Constraints:

1. *Liquidity constraint (ability to pay at all times)*: The sum of excess deposits to be realized from equity, debt and current receipts cannot be less than the distributions:

   - at $t = 0$

   $$\underbrace{-\sum_{j=1}^{J} g_{Kj0}x - Kj}_{depositsurplustoberealizedfromequityanddebt} + \underbrace{w_{K0}EN_K^{Ba}}_{desireddistribution} \leq \underbrace{b_{K0}}_{decision-independentpayments}$$

   where b_{K0} is the starting equity and $w_{K0}EN_K^{Ba}$ is the amount available for distribution at $t = 0$

   - at $t = 1, 2, ..., T$:

   $$\underbrace{-\sum_{j=1}^{J} g_{Kjt}x - Kj}_{depositsurplustoberealizedfromequityanddebt} + \underbrace{w_{Kt}EN_K^{Ba}}_{desireddistribution} \leq \underbrace{b_{Kt}}_{decision-independentpayments}$$

The structure of the future desired distributions is $w_{K1} : w_{K2} : ... : w_{KT-1} : w_{KT}$. If $w_{KT} = a + 1/i$ holds, then $w_{KT} EN_K^{Ba}$ represents both the distribution aEN_K^{Ba} and the amount of equity from which a continuous permanent distribution, EN_K^{Ba}, can be obtained if it is reinvested with interest. The payments b_{Kt} represent either planned future capital increases or autonomous future payment obligations, thus allowing for $b_{Kt} = 0$.

- *Capacity limits (constraints on the amounts of debt and equity)* The total of debt and equity, x_{Kj}, cannot breach the respective upper capacity limit (for $j = 1, 2, ..., J$):

$$x_{Kj} \leq x_{Kj}^{max}$$

- *Non-negativity conditions*: Neither the choice variables nor the flow of distributions can be negative:

  $x_{Kj}0\ EN_K \geq 0$

  The results from this model are the debt and equity amounts to be invested which, combined, form the buyer's baseline program. The buyer expects a maximum distribution stream, $EN_K^{Ba\ max}$, from the baseline program. Therefore, the expected distribution at time t is $w_{Kt} EN_K^{Ba\ max}$.

In the *second step* the valuation objet is included in the buyer's financing program (debt and equity). The result of this second step is the *valuation program*, which must include the valuation object. The maximum price a rational buyer will pay is the decision value subject to achieving at least the baseline program's target function.

The following model leads to the valuation program and the buyer's upper price limit when future distributions are summarized in the distribution vector $g_{UK} = (0; g_{UK1}; g_{UK2}; ...; g_{UKT})$[2]

Target function:

$$P \rightarrow max!$$

The price the buyer might pay is maximized under the following constraints:

Constraints:

1. *Liquidity constraint (ability to pay at all times)*: The sum of excess deposits to be realized from equity, debt and from decision-independent payments and from the company subject to valuation cannot be less than the distributions:

   - at $t = 0$, considering the still-to-be-negotiated purchase price P:

[2] at $t = 0$ the still-to be-negotiated purchase price P must also be considered.

$$-\sum_{j=1}^{J} g_{Kj0}x_{Kj} + P + w_{K0}EN_K^{Be} \leq b_{K0}$$

- at $t = 1, 2, ..., T$, considering the distributions g_{UKt}:

$$-\sum_{j=1}^{J} g_{Kjt}x_{Kj} + w_{Kt}EN_K^{Be} \leq b_{Kt} + g_{UKt}$$

- *Compliance with the baseline program's distribution stream,* $EN_K^{Be\max}$: The baseline program's distribution potential must be matched by the valuation program; i.e. in the case of an acquisition of the company at the marginal price:

$$EN_K^{Be} \geq EN_K^{Ba\max}$$

- *Capacity limits (constraints on the amounts of debt and equity)* The total of equity and debtx_{Kj} cannot breach the respective upper capacity limit (for $j = 1, 2, ..., J$):

$$x_{Kj} \leq x_{Kj}^{max}$$

- *Non-negativity conditions*: The choice variables cannot be negative and the buyer cannot be subsidized by the seller (i.e. negative purchase price):

$$x_{Kj} \geq 0$$
$$P \geq 0$$

To illustrate, we assume a multi-period planning horizon ($T = 4$), assuming quasi-certain expectations in order to determine the decision value using the marginal state price model from the buyer's viewpoint.

We further assume that the valuation subject already owns a small business KU at the valuation date $t = 0$, which is also the acquisition date. The valuation subject manages KU as a CEO and receives a constant deposit surplus from internal financing (IF) in the amount of 30. At $t = 0$, the valuation subject has the opportunity to make an investment AK. The cash flows from this investment include the purchase price ($-100, +30, +40, +50, +55$). At $t = 0$ the valuation subject owns personal assets (EM) from family sources in the amount of 10. At $t = 0$ the CEO's bank extends a term loan for investments in the valuation subject, ED, in the amount of 50 at an 8% annual interest rate and a four-year maturity. Additional working capital financing KA_t is available in unlimited amounts at a 10% interest rate. Interest-bearing deposits, GA_t, can be made at any time at an interest rate of 5%.

T	AK	ED	GA_0	GA_1	GA_2	GA_3	KA_0	KA_1	KA_2	KA_3	EM	IF	U
0	-100	50	-1				1				30	30	P?
1	30	-4	1.05	-1			-1.1	1				30	60
2	40	-4		1.05	-1			-1.1	1			30	40
3	50	-4			1.05	-1			-1.1	1		30	20
4	55	-54				1.05				-1.1		630	420
Limit	1	1	∞	∞	∞	∞	∞	∞	∞	∞	1	1	1

Figure 2. Example Data from the Buyer's Viewpoint

The valuation subject targets a uniform cash flow stream.

At $T = 4$ we get:

$$w_{\bar{K}T} EN_K^{Ba} = EN_K^{Ba} + \frac{EN_K^{Ba}}{i} \Rightarrow w_{\bar{K}T} = 1 + \frac{1}{i} = 1 + \frac{1}{.05} = 21$$

so the desired term structure of cash flows is:

$$w_{K0} : w_{K1} : w_{K2} : w_{K3} : w_{K4} = 1 : 1 : 1 : 1 : 21$$

In addition to the regular distribution, EN_K^{Ba}, the last distribution is the present value of a perpetuity at 5%.

At $t = 0$ the valuation subject may acquire another business, U, for which the estimated cash flow stream over the planning period is $g_{UK} = (0, 60, 40, 20, 20)$. In addition, the valuation subject expects a terminal value (present value of the perpetuity starting at $t = 5$) of 20. The valuation subject seeks to determine the maximum payable price P_{max} for business U.

Figure 2, above, summarizes the data for this example. In order to avoid discontinuities between the discrete planning period and the periods beyond, the perpetuities from internal cash flows and from U starting at time $t = 5$ are captured through the scalar 21.

In order to formulate the baseline program, the outputs are used in a linear optimization model, which we solve using the simplex algorithm:

$$EN_K^{Ba} \rightarrow max!$$

$100AK - 50ED + 1GA_0 - 1KA_0 + 1EN_K^{Ba} \leq 40$
$-30AK + 4ED - 1.05GA_0 + 1GA_1 + 1.1KA_0 - 1KA_1 + 1EN_K^{Ba} \leq 30$
$-40AK + 4ED - 1.05_GA_1 + 1GA_2 + 1.1KA_1 - 1_KA_2 + 1EN_K^{Ba} \leq 30$
$-50AK + 4ED - 1.05GA_2 + 1GA_3 + 1.1KA_2 - 1KA_3 + 1EN_K^{Ba} \leq 30$
$-55AK + 54ED - 1.05GA_3 + 1.1KA_3 + 21EN_K^{Ba} \leq 630$
$AK, ED, GA_0, GA_1, GA_2, GA_3, KA_0, KA_1, KA_2, KA_3, EN_K^{Ba} \geq 0$
$AK, ED \leq 1$

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$
Personal Assets EM	10				
Internal Financing IF	30	30	30	30	630
Investment AK	-100	30	40	50	55
Term Loan ED	42.7680	-3.4214	-3.4214	-3.4214	-46.1894
Revolver KA	49.8496	30.8736			
Interest-Bearing Deposits GA				-43.9610	
KA, GA Repayments		-54.8346	-33.9610		46.1591
Distribution EN	-32.6176	-32.6176	-32.6176	-32.6176	-32.6176
Payment Balance	0	0	0	0	652.3520
KA Debt Balance	49.8496				
GA Deposit Balance				43.9610	
Terminal Value $EN/.05$					652.3520

Figure 3. Complete Finance Schedule of the Buyer's Baseline Program

The simplex output to the linear optimization problem is the baseline program's complete finance schedule, presented in Figure 3, above:

Thus, the baseline program results in a maximum constant distribution stream of magnitude $EN_K^{Ba\max} = 32.6176$. At a 5% interest rate, the present value of $EN_K^{Ba\max}$ for perpetuity is 652.3520. The investment, AK, is financed using internal financing,IF, personal assets EM, the term loan ED, and the revolver KA. The liquidity constraint is met at all times, as the payments balance is 0 in periods $t = 1, 2, 3$, and a positive 652.3520 (after the distribution of $EN_K^{Ba\max}$ in $t = 4$.

If company U is included in the valuation program, then a uniform distribution of at least, we must achieve a uniform distribution of at lest the size of that of the baseline program. In order to determine the valuation program we use again the simplex algorithm to solve the linear optimization problem:

$$P \rightarrow max!$$

$100AK - 50ED + 1GA_0 - 1KA_0 + 1EN_K^{Be} + P \leq 40$
$-30AK + 4ED - 1.05GA_0 + 1GA_1 + 1.1KA_0 - 1KA_1 + 1EN_K^{Be} \leq 90$
$-40AK + 4ED - 1.05_GA_1 + 1GA_2 + 1.1KA_1 - 1KA_2 + 1EN_K^{Be} \leq 70$
$-50AK + 4ED - 1.05GA_2 + 1GA_3 + 1.1KA_2 - 1KA_3 + 1EN_K^{Be} \leq 50$
$-55AK + 54ED - 1.05GA_3 + 1.1KA_3 + 21EN_K^{Be} \leq 1050$
$EN_K^{Be} \geq 32.6176$
$AK, ED, GA_0, GA_1, GA_2, GA_3, KA_0, KA_1, KA_2, KA_3, P \geq 0$
$AK, ED \leq 1$

Figure 4, below, illustrates the valuation program's complete financing plan:

	$t=0$	$t=1$	$t=2$	$t=3$	$t=4$
Personal Assets EM	10				
Internal Financing IF	30	30	30	30	630
Company U		60	40	20	420
Investment AK	-100	30	40	50	55
Term Loan ED	50	-4	-4	-4	-54
Revolver KA	434.0726	394.0975	360.1248	332.7549	
Interest-Bearing Deposits GA					
KA Repayments		-477.4799	-433.5073	-396.1373	-366.0304
Distribution EN	-32.6176	-32.6176	-32.6176	-32.6176	-32.6176
Payment Balance	391.4550	0	0	0	652.3520
KA Debt Balance	434.0726	394.0975	360.1248	332.7549	
GA Deposit Balance					
Terminal Value $EN/.05$					652.3520

Figure 4. Complete Finance Schedule of the Buyer's Valuation Program

The marginal price, P_{max}, for company U is 391.4550. Under this scenario, at $t = 0$ the valuation subject invests in company U and, as already established in the baseline program, in object AK. The sources of funds are internal financing, IF, personal assets, EM, the term loan ED, and the revolver KA.

The decision value as the maximum price a buyer is willing to pay can be calculated in tabular form by subtracting the values from the valuation program from those of the baseline program. Figure 5, below, illustrates the changes which need to be made to the baseline program in order to get the valuation program. We call these differences the *comparison object*.

The comparison object's cash flows at $t > 0$ match the cash flows of the company under valuation such that there is profit equality between valuation and comparison objects.[3] The comparison object's cash released at $t = 0$ represents the upper price limit for the company under valuation.

The buyer's decision value is $P_{max} = 391.4550$. Because the cash flows from the comparison object are fixed, we can derive its discount rate. In our example, the comparison object's discount rate from the buyer's viewpoint is $r_K = 0.0983642$

If the expected distributions from the company under valuation are discounted at the comparison object's discount rate, the result is the value of future cash flows, $VFCF$, which is equal to the maximum price the buyer will be willing to pay; i.e. the decision value (see Figure 6, below).

Thus, the decision value can be calculated by discounting the future cash flows of the

[3]Note that the decision-oriented interpretation of the term "comparison object" is completely unrelated to "comparables" as understood in the fair market value literature.

	$t=0$	$t=1$	$t=2$	$t=3$	$t=4$
Personal Assets EM	10				
Internal Financing IF	30	30	30	30	630
Company U		60	40	20	420
Investment AK	-100	30	40	50	55
Term Loan ED	50	-4	-4	-4	-54
Revolver KA	434.0726	394.0975	360.1248	332.7549	
Interest-Bearing Deposits GA					
KA Repayments		-477.4799	-433.5073	-396.1373	-366.0304
Distribution EN	-32.6176	-32.6176	-32.6176	-32.6176	-32.6176
Payment Balance	391.4550	0	0	0	652.3520
KA Debt Balance	434.0726	394.0975	360.1248	332.7549	
GA Deposit Balance					
Terminal Value $EN/.05$					652.3520

Figure 5. Determination of the Buyer's Comparison Object

	$t=0$	$t=1$	$t=2$	$t=3$	$t=4$
Company U		60	40	20	420
r_K	.098364				
$(1+r_K)^t$	1	.910445	.82891	.754677	.687091
Present Value		54.6267	33.1564	15.0935	288.5784
Value of Future Cash Flows $VFCF$	391.4550				

Figure 6. Determination of Decision Value from the Buyer's Viewpoint Based on the Comparison Object's Discount Rate

company to be acquired by the discount rate of the comparison object. We prove this in the following section.

3.3 Value of Future Cash Flows Method - a Partial Model

The value of future cash flows method is a partial model which takes into account only the valuation object and not all possible states of the valuation model. Compared to the more general state marginal price model, a company valuation sheds a substantial amount of complexity by using the value of future cash flows method.

The value of future cash flows, $VFCF$, can be based on different valuation formulas depending on the structure of the expected distributions. The most important variations are discussed below:

1. For a finite planning horizon of T periods with constant cash flows, CF, and a flat term structure of interest rates:

$$VFCF = CF\frac{(1+i)^T - 1}{i(1+T)^T}$$

2. For a finite planning horizon of T periods with variable cash flows, CF, and a flat term structure of interest rates:

$$VFCF = \sum_{t=1}^{T} \frac{CF_t}{(1+i)^t}$$

3. For a finite planning horizon of T periods with variable cash flows, CF, and a non-flat term structure of interest rates:

$$VFCF = \sum_{t=1}^{T} \frac{CF_t}{\prod_{\tau=1}^{t}(1+i_\tau)}$$

4. For an infinite planning horizon with constant future cash flows, CF, and a flat term structure of interest rates:

$$VFCF = \lim_{T\to\infty} CF\frac{(1+i)^T - 1}{i(1+1)^T} = \frac{CF}{i}$$

5. For an infinite planning horizon with variable cash flows during the first T periods and subsequent constant cash flows and a flat term structure of interest rates:

$$VFCF = \sum_{t=1}^{T} \frac{CF_t}{(1+i)^T} + \frac{CF_{T+1}}{i}\frac{1}{(1+i)^T}$$

6. For a finite planning horizon with variable future cash flows during the first T periods and subsequent future cash flows increasing at a rate w for n periods and a flat term structure of interest rates (with $w \neq i$):

$$VFCF = \sum_{t=1}^{T} \frac{CF_t}{(1+i)^t} + CF_{T+1} \frac{1}{(1+i)^T} \frac{1}{i-w} \left(1 - \left(\frac{1+w}{1+i}\right)^{n+1}\right)$$

7. For an infinite planning horizon with variable future cash flows during the first T periods and subsequent future cash flows increasing indefinitely at a rate w and a flat term structure of interest rates (with $w < i$):

$$VFCF = \sum_{t=1}^{T} \frac{CF_t}{(1+i)^t} + CF_{T+1} \frac{1}{(1+i)^T} \frac{1}{i-w}$$

These formulas only explain the value of future cash flows' actuarial basis as a current value model but do not explain whether the future cash flow value is a decision value in the sense of a marginal price.

The use of this method to determine the decision value is only valid if the future cash flows formula can be theoretically supported, either generally or within limits and/or assumptions.

We use the *duality theory of linear optimization* to migrate from the general State Marginal Price Model to the partial Future Cash Flows Model. The duality theory posits that "each linear optimization task (*primal problem*) is assigned a closely-related *dual problem* which allows for conclusions regarding the valid contexts contained in the optimum solution" (Hering, 2006). In calculating the maximum price a buyer will be willing to pay, P_{max}, the primal problem is the valuation program from the buyer's viewpoint, which we briefly restate below:

$$P \rightarrow max!$$

1. Liquidity Constraints
   (a) $-\sum_{j=1}^{J} g_{Kj0} x_{Kj} + P + w_{K0} EN_K^{Be} \leq b_{K0} \;\; (t = 0)$
   (b) $-\sum_{j=1}^{J} g_{Kjt} x_{Kj} + w_{Kt} EN_K^{Be} \leq b_{Kt} + g_{UKt} \;\; (t = 1, 2, ..., T)$
2. Distribution Constraint $EN_K^{Be} \geq EN_K^{Ba\,\max}$
3. Capacity Constraint $x_{Kj} \leq x_{Kj}^{max} \;\; (j = 1, 2, ..., J)$
4. Non-Negativity Constraints
   (a) $x_{Kj} \geq 0 \;\; (j = 1, 2, ..., J)$

(b) $EN_K^{Be} \geq 0$

(c) $P \geq 0$

The outputs of the primal problem are (i) the magnitude of the debt and equity objects x_{Kj}, (ii) the size of the distribution stream, EN_K^{Be}, and (iii) the valuation object's potential price P. In order to maximize P, the optimum solution must satisfy the distribution constraint (2) with equality, i.e. the valuation program's distribution stream needs to match the baseline program's maximum distribution stream: $EN_K^{Be} = EN_K^{Ba\max}$

The respective *dual problem* is then (Gale, Kuhn, Tucker, 1951):

$$K := \sum_{t=0}^{T} b_{Kt}d_t + \sum_{t=1}^{T} g_{UKt}d_t - \delta EN_K^{Ba\max} + \sum_{j=1}^{J} x_{Kj}^{max}u_j \to min!$$

1. Debt and Equity Constraint: $= \sum_{t=0}^{T} g_{Kjt}d_t + u_j \geq 0 \;\; (j = 1, 2, ..., J)$
2. Distribution Stream Weight Factors Constraint: $\sum_{t=0}^{T} w_{Kt}d_t - \delta \geq 0$
3. Constraints on the Dual Variables of the Liquidity Constraints:
   (a) $d_0 \geq 1 \;\; (t = 0)$
   (b) $d_t \geq 0 \;\; (t = 1, 2, ..., T)$
4. Constraints on the Dual Variables of the Capacity Constraint: $u_j \geq 0 \;\; (j = 1, 2, ..., T)$
5. Constraint on the Dual Variables of the Distribution Constraint: $\delta \geq 0$

The autonomous payments, b_{Kt}, correspond to the right-hand sides of the valuation program's distribution constraints excluding the distributions from the company under valuation ; i.e. the right-hand sides of the baseline program's distribution constraints. The dual problem's variables to be determined are the dual variables d_t (for the liquidity constraint in $t = 0, 1, ..., T$), u_j (for the capacity constraint in $j = 1, 2, ..., J), and\delta$ (for the distribution stream constraint). The optimization goal for the dual problem is to find the dual variables which minimize the sum of the constraints' right-hand sides (i.e. which minimize the opportunity costs, K, of those constraints). The dual problem's optimum solution is then K_{min}.

From the conditions $EN_K^{Be} = EN_K^{Ba\max}$ and $EN_K^{Be} \geq 0$ in the primal problem and from $EN_K^{Ba\max} \geq 0$ as the optimal solution for the baseline program, it follows that, at the optimum of the dual problem, the distribution constraint (2)must satisfy:

$\sum_{t=0}^{T} w_{Kt}d_t - \delta \geq 0$
and
$\delta = \sum_{t=0}^{T} w_{Kt}d_t$

It follows that the maximum of the primal problem (with solution P_{max}) equals the minimum of the dual problem (with solution K_{min}). Because of this relationship we can use the definition equation for K to calculate P_{max}. In addition, if we consider the solution for δ, we can use the following equation to calculate the decision value P_{max}:

$$P_{max} = \sum_{t=0}^{T} b_{Kt} d_t + \sum_{t=1}^{T} g_{UKt} d_t + \sum_{j=1}^{J} x_{Kj}^{max} u_j - EN_K^{Ba\,\max} \sum_{t=0}^{T} w_{Kt} d_t$$

$P = P_{max} > 0$ holds in the primal problem's optimal solution, therefore the primal problem's liquidity constraint (a) is slack. From the theorem of complementary slackness it follows that the constraint (a) must be binding so that $d_0 = 1$ holds. The meaning of $d_0 = 1$ is that today's distributions are included in the calculation of P_{max} without modification. The relationship $d_t/d_0 =: \rho_{Kt}^{Be}$ holds for the other dual variables d_t for $(t = 1, 2, ..., T)$, where ρ_{Kt}^{Be} are the valuation program's discount factors, which are, in turn, derived from the buyer's valuation program's marginal discount rates i_{Kt}^{Be} (Rollberg, 2001; Hering, 2008):

$$\rho_{Kt}^{Be} = \frac{1}{\prod_{\tau=1}^{t}(1 + i_{Kt}^{Be})}$$

This means that 1 dollar at $t > 0$ is worth ρ_{Kt}^{Be} dollars at $t = 0$, so future distributions are included in the calculation of P_{max} at their present value.

For debt and equity objects j contained in the program, constraint (1) of the dual problem is satisfied at its lower limit:

$$-\sum_{t=0}^{T} g_{Kjt} d_t + u_j = 0 \Longleftrightarrow u_j = \sum_{t=0}^{T} g_{Kjt} d_t$$

which results in a non-negative capital value, $C_{Kj}^{Be} \geq 0$ at $t = 0$. Since C_{Kj}^{Be} is expressed in present value terms, it follows from the theory of marginal cost pricing that $C_{Kj}^{Be} d_0 = u_j$ holds and, consequently, because $d_0 = 1$, u_j and C_{Kj}^{Be} are identical.

In the case of disadvantageous debt and equity objects, constraint (1) of the dual problem is slack. It follows that constraint (5) of the dual problem must be binding, hence the dual variable u_j is 0 for disadvantageous debt and equity objects with negative capital value.

Therefore, P_{max} may be expressed as:

$$P_{max} = \sum_{t=0}^{T} b_{Kt} d_t + \sum_{t=1}^{T} g_{UKt} d_t + \sum_{j=1}^{J} x_{Kj}^{max} u_j - EN_K^{Ba\,\max} \sum_{t=0}^{T} w_{Kt} d_t$$

or because: $\frac{d_t}{d_0} =: \rho_{Kt}^{Be}$
and: $d_0 = 1$

and: $C^{Be}_{Kj} = \sum_{t=1}^{T} g_{Kjt}\rho^{Be}_{Kt}$
then:

$$P_{max} = \sum_{t=0}^{T} b_{Kt}\rho^{Be}_{Kt} + \sum_{t=1}^{T} x^{max}_{Kj} C^{Be}_{Kj} - EN^{Ba\max}_{K} \sum t = 0^T w_{Kt}\rho^{Be}_{Kt}$$

Which results in the "complex" valuation formula (Laux, Franke, 1969; Hering, 2006):

$$P_{max} = \sum_{t=1}^{T} g_{UKt}\rho^{Be}_{Kt} + \sum_{t=0}^{T} b_{Kt}\rho^{Be}_{Kt} + \sum_{j=1}^{J} x^{max}_{Kj} C^{Be}_{Kj} - \sum_{t=0}^{T} w_{Kt} EN^{Ba\max}_{K}{}_{-}Kt^{Be}$$

The "complex" formula tells us that the maximum price a buyer will be willing to pay, P_{max}, can be calculated as the difference between (i) the valuation program's capital value (before considering a price for the business under valuation), and (ii) the baseline program's capital value (which must be given up if the business is to be acquired). Figure 5, above, illustrates the use of the "complex" formula.

The future cash flow value of the business under valuation is part of the valuation program's capital value (before considering a price for the business under valuation) and does not need to equal the decision value, P_{max}, from the buyer's viewpoint. Conversely, the valuation program is the buyer's best program when the negotiated price, P, equals the decision value P_{max}.

By rearranging the formula for the decision value, P_{max}, we get the following formula from the buyer's viewpoint:

$$P_{max} = \underbrace{\sum_{t=1}^{T} \overbrace{g_{UKt}}^{1}\overbrace{\rho^{Be}_{Kt}}^{2}}_{4} + \underbrace{\sum_{t=0}^{T} \rho^{Be}_{Kt} + \overbrace{\sum_{C_{Kj}>0} x^{max}_{Kj} C^{Be}_{Kj}}^{3}}_{5} - \underbrace{\sum_{t=0}^{T} w_{kt} EN^{Ba\max}_{K}\rho^{Be}_{Kt}}_{6}$$

where:

1. distributions of the valuation object
2. discount factor
3. sum of the positive capital values
4. value of future cash flows of the business under valuation
5. valuation program's capital value (without the valuation object)
6. baseline program's capital value

Therefore, the maximum price the buyer is going to be willing to pay as the buyer's decision value, P_{max}, will be a function of the value of future cash flows $VFCF$ and the capital value difference from transforming the buyer's baseline program into his valuation program:

$$P_{max} = CFCG_U^K \rho_{Kt}^{Be} +_K^{Be-Ba}$$

with:

$$\sum KW_K^{Be-Ba} \geq 0$$

so that:

$$VFCF_U^K \rho_{Kt}^{Be} = P_{max} - \sum KW_K^{Be-Ba}$$

or:

$$VFCF_U^K \rho_{Kt}^{Be} \leq P_{max}$$

The future cash flow value based on the valuation program's marginal discount rate is, therefore, the buyer's decision value's lower bound.

In order to determine the buyer's decision value's *upper bound* we first establish the dual problem for the determination of the buyer's baseline program. The buyer's decision value's upper bound corresponds to the value of future cash flows, $VFCF_U^K \rho_{Kt}^{Ba}$, discounted at the baseline program's discount rate. We can compute the value of future cash flows by using the "simplified"[4]valuation by using the baseline program's endogenous marginal discount rate.[5]

$$P_{max} \leq \sum_{t=1}^{T} g_{UKt}$$

The buyer's decision value, P_{max}, must therefore lie between the following limits (Hering, 2006):

$$VFCF_U^K \rho_{Kt^{Be} \leq P_{max} \leq VFCF_U^K \rho_{Kt}^{Ba}}$$

or

$$\sum_{t=1}^{T} g_{UKt} \frac{1}{\prod_{\tau=1}^{t}(1+i_{Kt}^{Be})} \leq P_{max} \leq \sum_{t=1}^{T} g_{UKt} \frac{1}{\prod_{\tau=1}^{t}(1+i_{Kt}^{Ba})}$$

The lower bound is the value of future cash flows discounted at the endogenous marginal discount rate of the valuation program, and the upper bound is the value of future cash

[4]i.e., based on the distributions from the company under valuation without considering the transformation of the baseline program into the valuation program

[5]The fact that the value of future cash flows discounted at the base program's endogenous marginal discount rates represents the upper bound for the buyer's decision value P_{max} follows from a plausible consideration: if P_{max} exceeded the value of future cash flows, paying P_{max} would be unprofitable because capital would be negative.

	$t=0$	$t=1$	$t=2$	$t=3$	$t=4$
Company U		60	40	20	420
Baseline Program Endogenous Marginal Discount Rates					
i_{Kt}^{Ba}		.1	.1	.0639	.05
Discount Factor ρ_{Kt}^{Ba}		.9090909	.8264463	.776802	.7398174
Present Value		54.5455	33.0579	15.5362	310.7233
Valuation Program Endogenous Marginal Discount Rates					
i_{Kt}^{Be}		.1	.1	.1	.1
Discount Factor ρ_{Kt}^{Be}		.9090909	.8264463	.7513148	.6830135
Present Value		54.5455	33.0579	15.0263	286.8657
$VFCF_U^K \rho_{Kt}^{Be}$	389.4953				

Figure 7. Upper and Lower Bounds of the Decision Value P_{max}

flows discounted at the endogenous marginal discount rate of the baseline program (under the "simplified" formula). The simplified model gives us only lower and upper bounds for the decision value. An exact calculation of the decision value will require the use of the general model.

Thus, in the context of incomplete and imperfect capital markets, the future value of cash flows method only narrows down the area within which the buyer's decision value, P_{max}, lies. For this interval to be meaningful, we need to estimate as precisely as possible the baseline and valuation program's endogenous marginal discount rate.[6]

In the numerical example the state marginal price model returned a value of 391.455 dollars for the maximum price the buyer would be willing to pay. From the base program's dual problem (see Figure 4), we derived endogenous marginal discount rates of 10% for the first and second periods, 6.39% for the third, and 5% for the fourth period.[7]

In the *valuation program* the only marginal transactions are the borrowings under the revolver KA at 10% (see Figure 5).

Figure 7, above, consolidates the upper and lower bounds of the maximum price the buyer will be willing to pay. As expected, $VFCF_U^K \rho_{Kt}^{Be} \leq P_{max} \leq VFCF_U^K \rho_{Kt}^{Ba}$ holds. In numerical terms: $389.4953 < P_{max} = 391.4550 < 413.8628$.

[6]If the endogenous marginal discount rates of both programs are the same, transformations between the baseline and valuation programs are achieved with a zero capital charge; i.e. ${}_{K}^{Be-Ba} = 0$. In such a situation, the "simplified" model can be used to calculate the exact decision value as the maximum price the buyer will be willing to pay. Moreover, the "simplified" method is always applicable in a perfect capital market because marginal transactions are always carried out at the current market discount rate i. It follows that $\rho_{Kt}^{Be} = \rho_{Kt}^{Ba} = (1+i)^{-1}$ holds if we assume that the discount rate is constant over time.

[7]From solving the baseline program's dual problem we got the following values for the liquidity constraint: $d_0 = .05249704$, $d_1 = .047772458$, $d_2 = .04338599$, $d3 = .0407805$, $d_4 = .03883866$. The discount factors for period t are $\rho_t = d_t/d_o$. The endogenous marginal discount rates i_t for period t are: $i_t = \rho_{t-1}/\rho_t - 1$.

Figure 8, below, illustrates the "complex" calculation formula. Since it assumes knowledge of the endogenous marginal discount rate, it returns the buyer's exact decision value P_{max}.[8]

4 Functional Valuation vs. Fair Market Value Valuation

Functional business valuation is *particular*; i.e. it takes account of the concrete goals, plans, expectations, and degrees of freedom of the valuation subjects in imperfect and incomplete markets. It is also *conflict-oriented*, as it considers possible interpersonal conflicts in connection with ownership changes among a few decision subjects with several conflict-relevant issues. As any financial model, functional valuation simplifies reality but allows for the intersubjective analysis of issues foreign to the model.

In contrast, *fair market value valuation* relies on an idealized model of the world based on neo-classical finance theory. It is anonymous and implicitly incorporates all of the CAPM's assumptions concerning the efficiency and completeness of the capital markets and the rationality and risk-aversion of their participants; i.e. fair market value is a *supraindividual* measure.

Moreover, the fair market value has spawned a vast industry of consultants whose only "theoretical" questioning of the standard revolves around the futile question of how different DCF methods can be made to converge to the same valuation. Different valuation results are considered annoying by fair market value practitioners (like me), as they may undermine the belief in the standard and, consequently, the authority of the fair market value appraisers as secular priests who know the secrets of the "market value".

No single DCF method (equity approach, entity approach, WACC approach, APV approach, etc.) relies on a decision-theoretical foundation. However, DCF methods offer fertile ground for argumentation values due to their numerous inherent possibilities for manipulation.

From the viewpoint of functional business valuation theory, DCF methods can be used to bolster arguments put forward by a negotiating counterpart under two conditions:

1. the value so determined may not violate the arguing party's decision value; and

2. the conflicting party using it as an argumentation aid must be convinced that it may impress his negotiating counterpart and lead to a favorable outcome.

   Every negotiating/conflicting party should however be mindful of the limitations of the fair market value methodologies and should never let those methods dictate their limit of concession willingness – the decision value.

[8] The aggregate cash flows and associated capital value of the revolver KA are shown to clarify that borrowings under the revolver are the marginal transactions.

	$t = 0$	$t = 1$	$t = 2$	$t = 3$	$t = 4$
Valuation Program Payment Constraints Right-Hand Side					
(Without Distributions from the Business Under Valuation)					
Right-Hand Side b_{Kt}	40	30	30	30	630
Discount Factor ρ_{Kt}^{Be}	1	.9090909	.8264463	.7513148	.6830135
Present Value $b_{Kt}\rho_{Kt}^{Be}$	40	27.2727	24.7934	22.5394	430.2985
Present Value Sum $\Sigma b_{Kt}\rho_{Kt}^{Be}$	544.9040				
Capital Value					
Equity AK	-100	30	40	50	55
Discount Factor ρ_{Kt}^{Be}	1	,9090909	.8264463	.7513148	.6830135
Present Value Equity AK	-100	27.2727	33.0579	37.5657	37.5657
Capital Value Equity AK	35.4621				
Term Loan ED	50	-4	-4	-4	-54
Discount Factor ρ_{Kt}^{Be}	1	.9090909	.8264463	.7513148	.6830135
Present Value Term Loan ED	50	-3.6364	-3.3058	-3.0053	-36.8827
Capital Value Term Loan ED	3.1699				
Revolver AK	434.1446	-83.3867	-73.3867	-63.3867	-366.1202
Discount Factor ρ_{Kt}^{Be}	1	.9090909	.8264463	.7513148	.6830135
Present Value Revolver AK	434.1446	-75.8061	-60.6502	-47.6234	-250.0650
Capital Value Revolver AK	0				
Distributions $w_{Kt}EN_K^{Ba\max}	32.6176	32.6176	32.6176	32.6176	684.9696
Discount Factor ρ_{Kt}^{Be}	1	.9090909	.8264463	.7513148	.6830135
Present Value Distributions	32.6176	29.6524	26.9567	24.5061	467.8435
Capital Value Baseline Program	581.5762				
$VFCF_U^K\rho_{Kt}^{Be}$	389.4953				
+ Present Value Sum Σb_{Kt}^{Be}	544.9040		Present Value of the		
+ Capital Value AK	35.4621		Remaining		583.5360
+ Capital Value ED	3.1699		Valuation Program		
- Capital Value Baseline Program	-581.5762				
$\Sigma = P_{max}$	391.4550				

Figure 8. Components of the Buyer's "Complex" Calculation Formula

5 Conclusion

The fair market value standard is just that: a standard. There are many reasons why it became the standard of choice for dispute resolution, chief among them it simplicity. But that simplicity carries a heavy price: the fair market value standard is not the valuation methodology that is applied by buyers and sellers of business who later enter into conflict; their investment decision process being much more closely related to the functional valuation model we described in this article. For an investor, the difference in the methodology used to decide on the investment and the methodology used in adjudicating a dispute introduces a systematic bias, the result of which being that many legitimate investment grievances may never reach the courts (for fear of a double-loss) or, the even worse consequence where an aggrieved investor may lose twice: first via the real investment harm and later via the adjudication of the dispute based on a standard which is alien to both party's original bargaining process. It is my hope that some in the legal community will take notice of this systematic bias and that the dispute resolution sections of M&A agreements will start incorporating standards and remedies which more closely track the parties' original investment process.