Personal Taxes in Business Valuation and its Constraints in Adaptation – From a theoretical analysis to the question of the Tax-CAPM's empirical evidence

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I. Introduction and Course of Investigation

When reviewing the development in the domain of business valuation over the last decades from a theoretical as well as a practical point of view it has to be considered that tremendous progress has been made. The prevalent literature on business valuation reveals that the focal points of discussion have gotten more detailed. One of these detailed issues discussed controversially is the consideration of personal taxes in the light of business valuation[1]. In contrast to the consensus on the relevance of corporate income taxes, application-oriented standard setters have not found a consensus on the consideration of personal taxes yet[2].

The goal of the underlying paper is to elaborate on this issue from a theoretical, practical as well as empirical perspective. In a first step, two theories will be introduced and, thereby, an approach on how to adjust the valuation calculus for personal income taxes. Subsequently it is the goal to show how valuation professionals may adapt the calculus to constantly changing tax settings and what challenges this adjustment includes. The latter point of discussion will be emphasized by the development of the various German tax law reforms enacted since 1990. Having derived a theoretical basis and the Tax-CAPM as the prevalent approach with respect to the consideration of personal taxes, the third section of the paper elaborates on the Tax-CAPM's empirical evidence. It will be tested whether the model is able to explain after-tax returns of shares on capital markets or not. The paper concludes by discussing the trade-off between complexity and accuracy in business valuation with respect to the findings of each section.

II. Full-Tax-Thesis vs. No-Tax-Thesis Proponents

When reviewing the prevalent literature on the topic of personal taxes in business valuation two groups of thought can be identified within this controversial debate[3]. On the one hand, the full-tax-thesis supporters argue that personal taxes have to be considered in the scope of objectified valuation motives. On the other hand, the no-tax-thesis followers assert that personal taxes are of irrelevance in certain circumstances. It has to be emphasized that proponents of the latter group do not neglect personal taxes at all; they have rather identified specific circumstances in which the equity value is not affected by taking personal taxes into account[4]. *Figure 1* on page 189 introduces the proponents of the respective groups.

As shown, the full-tax-thesis supporters argue that cash flows and discount factor have to be adjusted for personal taxes due to different tax rates on dividend yields, interest, and capital gains by means of the Tax-CAPM[5]. However, proponents like Moxter, Ollmann & Richter, and Wiese state that certain irrelevance cases allow for the negligence of personal taxes[6]. Hence, these proponents can be found in both groups.

Full-Tax-Thesis Perspective

The proponent's central argument for the consideration of personal taxes is that at the end of the day an investor is only interested in net cash flows, since only net income is able to satisfy the owner's consumption needs[7]. Furthermore, it is argued that it is the overall goal of any corporation to maximize shareholder value or, to put it differently, to maximize the income provided by the company to the shareholders to enable them satisfying their consumption needs[8]. Therefore, just like corporate taxes, personal taxes can be regarded as negative contributions to the shareholder's income available for consumption purposes. Consequently, and by means of Moxter's principles of equivalence, the non-consideration of personal taxes would lead to a breach of these general valuation principles and consequently result in wrong equity values.

So far, the highlighted line of argumentation has not been translated into an adaptation of the valuation calculus. The consistent incorporation of personal tax adjustment factors

1 Dausend & Schmitt, FINANZ BETRIEB 5/2007 p. 287-292; Hommel & Pauly, Betriebs-Berater 21/2007 p. 1155-1162; Hommel & Pauly, Betriebs-Berater 50/2007 p. 2728-2732; Hommel, Dehmel & Pauly, Betriebs-Berater 2005, BB-Special 7, 60, 13-18; Rapp & Schwetzler, FINANZ BETRIEB 2/2007 p.108-116; Streitferdt, FINANZ BETRIEB 4/2008 p. 268-276; Wiese, FINANZ BETRIEB 2/2007 p.116-120.

2 Note: Personal taxes are only relevant within the scope of objectified business valuations, e.g. squeeze outs. A shareholder has to be involved directly and affected on his or her personal level. All M&A activities are not subject to this discussion.

3 Hommel, Dehmel & Pauly, Betriebs-Berater 2005, BB-Special 7, 60 p. 15.

4 Richter, Schmalenbach Business Review, 56 p. 20.

5 Brennan, National Tax Journal 1970 p. 417-427.

6 Moxter, Grundsätze ordnungsmäßiger Unternehmensbewertung 1983; Ollmann & Richter, Kapitalmarktorientierte Unternehmensbewertung und Einkommensteuer – Eine deutsche Perspektive im Kontext internationaler Praxis 1999 p. 159-178; Wiese, Working Paper, Munich School of Management 2003, 1-42.

7 Moxter, Grundsätze ordnungsmäßiger Unternehmensbewertung 1983 p. 178.

8 Schmidbauer, Betriebs-Berater 24/2002 p. 1252.

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It is recommended that valuation practitioners adhere to the Standard-CAPM when it comes to objectified business valuation as long as the Tax-CAPM does not comply with basic valuation principles.

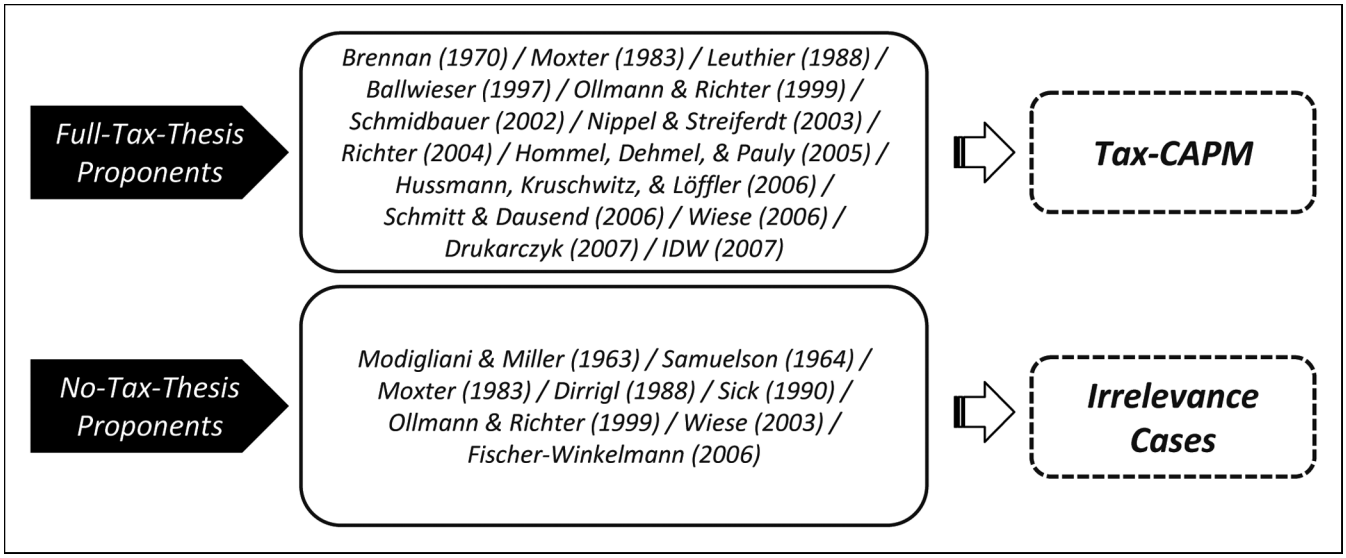

Figure 1: Full-Tax-Thesis vs. No-Tax-Thesis Proponents.

$$EV = \sum_{t=1}^{T} \frac{FTE_t^{\text{before personal taxes}} \cdot (1 - T_{P,d})}{\left(1 + \left(r_f \cdot (1 - T_{P,i}) + \beta_{\text{levered},i} \left(c_m \cdot (1 - T_{P,c}) + d_m \cdot (1 - T_{P,d}) - r_f \cdot (1 - T_{P,i})\right)\right)\right)^t} +$$

$$\frac{\left(FTE_T^{\text{before personal taxes}} \cdot (1+g)\right) \cdot (1 - T_{P,d})}{\left(\left(r_f \cdot (1 - T_{P,i}) + \beta_{\text{levered},i} \left(c_m \cdot (1 - T_{P,c}) + d_m \cdot (1 - T_{P,d}) - r_f \cdot (1 - T_{P,i})\right)\right) - g\right)}{\left(1 + \left(r_f \cdot (1 - T_{P,i}) + \beta_{\text{levered},i} \left(c_m \cdot (1 - T_{P,c}) + d_m \cdot (1 - T_{P,d}) - r_f \cdot (1 - T_{P,i})\right)\right)\right)^T}$$

Figure 2: FTE Approach adjusted for personal taxes with perpetuity and growth.

into the calculus can be regarded as the most challenging part due to certain theoretical constraints[9].

In order to demonstrate how the calculus has to be adapted, the prevalent Flow to Equity (FTE)[10] approach and Brennan's Tax-CAPM – as the most appropriate approach to account for personal taxes – are applied[11]. Within the underlying section no particular tax regime is assumed, hence, a flexible calculus is required, that is able to reflect heterogeneous tax rates for the Tax-CAPM's taxable components[12]. Implementing these assumptions yields the FTE approach adjusted for personal taxes in the multi-period case with perpetuity and growth[13].

At first glance, the formula shown in *Figure 2* seems to be complex in its structure and very comprehensive, but dismantled it will reveal the opposite. The first term shows the detailed planning horizon t, in which the respective dividends expected to flow to the shareholders are taxed at the personal income tax rate $T_{P,d}$ and are discounted at the levered cost of capital derived by means of the Tax-CAPM. Contrary to the Sharpe-Lintner Standard-CAPM the return of the market surrogate is split up into capital gains c_m and dividend yields d_m, which are taxed at the personal income tax rates $T_{P,c}$ and $T_{P,d}$ respectively[14]. In addition to that the risk-free interest rate r_f is subject to taxation and, hence, taxed at the rate $T_{P,i}$. Accordingly, the expression in parentheses following the

9 Ollmann & Richter, Kapitalmarktorientierte Unternehmensbewertung und Einkommensteuer – Eine deutsche Perspektive im Kontext internationaler Praxis 1999 p. 159-178.
10 In the valuation context Flows to Equity can be regarded as dividend payments to the shareholders.
11 Brennan, National Tax Journal 1970 p. 417-427.
12 Taxable components are the risk-free interest rate as well as capital gains and dividend yield of the market portfolio.
13 For the basic FTE approach please refer to Gantenbein & Gehrig, Der Schweizer Treuhänder 2007 p. 608.
14 For further information on the Standard CAPM please refer to Sharpe, Journal of Finance, 19 p. 452-442.

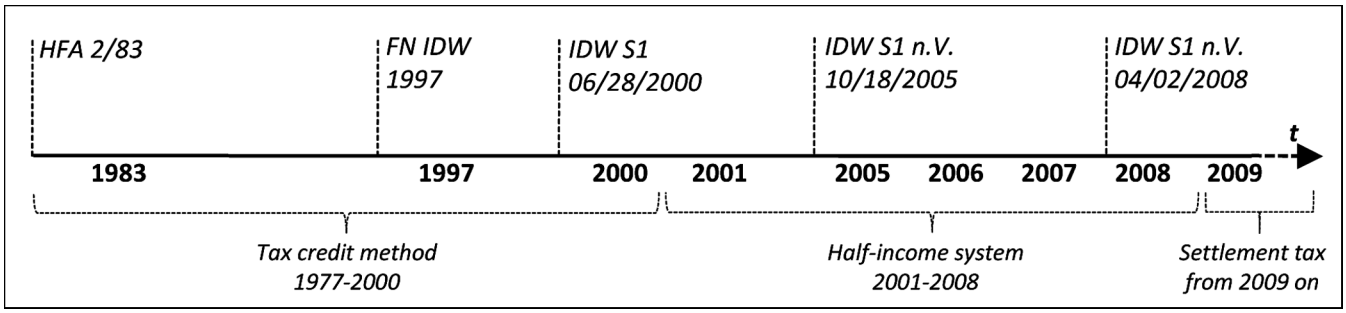

Figure 3: Development of IDW S1 and prevailing tax regulations from 1983 to 2009.

levered Beta $\beta_{levered,i}$ of the valuation object *i* can be referred to as the market risk premium after personal taxes. The second part of *Figure 2* shows the perpetuity term of the valuation calculus, which follows the same logic as the first term in light of personal tax adjustments, but in addition accounts for long-term growth *g*. The resulting term after growth is discounted at the after tax levered cost of equity to the power of *T*, representing the length of the planning horizon.

On the basis of the presented valuation calculus the full-tax-thesis proponent's argumentation becomes clear. Even if one would assume that all tax adjustment factors are equal to each other cancelling out these factors would be wrong from a mathematical perspective; because the parentheses and the expression *to the power of t* within the denominator do not allow for this operation. To conclude, comparing the valuation cases with and without personal tax adjustments in a regime with homogenous tax rates reveals that different equity values result due to the compound interest effect in the denominator.

No-Tax-Thesis Perspective

The no-tax-thesis is rather driven by utopia than by an assessor's everyday life[15]. Nevertheless, from a theoretical perspective there is no doubt on its right of existence. But due to the lack of relevance it will solely be touched on the no-tax proponent's argumentation by means of two examples in order to give a brief insight. When reviewing the literature on no-tax-thesis cases and the way the irrelevance is derived one can notice that all cases have a simplification in common, which is the absence of the planning-horizon in the valuation calculus. In other words, the calculus is limited to the second term of *Figure 2* on page 189 without the lower denominator. Hence, the mathematical expression „to the power of T„ is omitted, what allows for more rearrangements of the valuation calculus[16]. Even though this assumption is not misleading from a theoretical point of view it does not reflect how valuation calculi are designed in practice.

Howsoever, taking the perpetuity model as the relevant basis for granted the following two irrelevance cases are introduced as examples for the irrelevance of personal taxes.

1. The first case assumes a tax regime with the same tax rates on the risk-free interest rate and dividend yields; capital gains are not subject to taxes. Moreover, it is assumed that Beta is zero, which implies, that the valuation object's cash flows are certain. In addition, no growth is assumed. Altogether these assumptions allow simplifying the calculus to such an extent, that the respective equity value is determined by dividing the dividend payments by the risk-free interest rate. Due to a Beta of zero the market risk premium disappears and the tax adjustment factors are cancelled, what reduces the fraction to the dividends and the risk-free rate[17].
2. As a second case it is assumed that dividends and interest are taxed differently, whereas capital gains remain untaxed, i.e. the *raw* Tax-CAPM as developed by Brennan follows. Furthermore, a Beta of one is assumed, which infers that the valuation object faces an identical risk structure as the alternative investment. Incorporating these assumptions into the perpetuity model with growth allows for cancelling the risk-free interest rates in the denominator due to Beta being one. Moreover, from a Beta of one it can be inferred that the capital gains c_m of the market portfolio are equal to the growth rate of the valuation object, i.e. $g = c_m$. Consequently *g* can be cancelled in the denominator, which then allows for cancelling the market portfolio's and valuation object's dividend tax adjustment factors. Discounting the expected dividends of the valuation object by the dividend yield of the market portfolio yields the equity value[18].

There are several other irrelevance cases, which are in its probabilities of occurrence as unlikely as the two cases introduced above. In the course of objectified valuations a practitioner will most unlikely be confronted with a Beta of zero or one. Even if, a *real-life valuation model* would account for a detailed planning horizon and thereby take the irrelevance cases ad absurdum.

III. The German Full-Tax-Thesis

From a theoretical perspective it can be agreed upon the fact that there is a need to adjust for personal taxes in the course of objectified business valuations. Notwithstanding, when reviewing the valuation standards of major international and application-oriented standard setters it becomes evident that most of them go along with the no-tax-thesis, though without providing any reasons for doing so[19].

The German *Institut der Deutschen Wirtschaftsprüfer (IDW)*[20] is the only standard setter within the valuation domain which clearly advocates the consideration of personal taxes regarding objectified business valuations. Hence, it is the goal of

15 Richter, Schmalenbach Business Review 2004, 56 p. 33.
16 Kruschwitz & Löffler, Zeitschrift für Betriebswirtschaft 2004, 74 p. 1181.
17 Ollmann & Richter, Kapitalmarktorientierte Unternehmensbewertung und Einkommensteuer – Eine deutsche Perspektive im Kontext internationaler Praxis 1999 p. 170.
18 Richter, Schmalenbach Business Review 2004, 56 p. 31.
19 Richter, Schmalenbach Business Review 2004, 56 p. 21.
20 Institute of German Certified Public Accountants

Standard	Valuation Calculus	Marginal Tax Rate	Equity Value
IDW S1 (2000)	$\sum_{t=1}^{T} \frac{FTE_t^{\text{before personal taxes}} \cdot (1-T_P)}{\left(1+\left(r_f+\beta_{levered,i}\left(E\left(\tilde{R}_m\right)-r_f\right)\right)\cdot(1-T_P)\right)^t}$ $\sum_{t=1}^{T} \frac{FTE_t^{\text{before personal taxes}} \cdot \left(1-\frac{T_P}{2}\right)}{\left(1+\left(r_f+\beta_{levered,i}\left(\tilde{R}_m-r_f\right)\right)\cdot(1-T_P)\right)^t}$	$T_P = 35\%$	⬆
IDW S1 (2005)	$\sum_{t=1}^{T} \frac{FTE_t^{\text{before personal taxes}} \cdot \left(1-\frac{T_P}{2}\right)}{\left(1+\left(r_f\cdot(1-T_P)+\beta_i\left(E\left(\tilde{R}_m\right)-d_m\cdot\frac{T_P}{2}-r_f\cdot(1-T_P)\right)\right)\right)^t}$	$T_P = 35\%$	⬇
IDW S1 (2008)	$\sum_{t=1}^{T} \frac{FTE_t^{\text{before personal taxes}} \cdot (1-T_P)}{\left(1+\left(r_f\cdot(1-T_P)+\beta_i\left(E\left(\tilde{R}_m\right)-d_m\cdot T_P-c_m\cdot\frac{T_P}{2}-r_f\cdot(1-T_P)\right)\right)\right)^t}$	$T_P = 25\%$	⇩

Figure 4: Development of the after-tax valuation calculus without perpetuity under IDW S1.

the underlying section to show how the valuation calculus has been adapted over time according to the different tax law reforms enacted. *Figure 3* highlights the development of the German valuation standard *IDW S1* and the various personal tax regulations effective from 1983 to 2009.

Before 1997 the *IDW* neglected personal income taxes, because it was assumed that there is only a marginal difference between pre- and after-tax business values[21]. Due to several studies which demonstrated the opposite the *IDW* changed its opinion and supported the consideration of personal income taxes in 1997 for the first time[22]. In June 2000 the previous statements were replaced by the first *IDW S1* called „Grundsätze zur Durchführung von Unternehmensbewertungen“[23]; the standard still recommended the consideration of personal income taxes by proposing an adjustment of cash flows and discount factor with a lump-sum factor in the form $(1\text{-}T_P)$[24].

As illustrated in *Figure 3* on page 190 a revised version of the standard became effective as of October 18, 2005. The main reason was the introduction of the half-income system, which replaced the tax credit method. The new regulation effective from January 1, 2001 stated that half of the dividends received are subject to taxation according to § 3 No. 40 German income tax law[25]. What is more, the *IDW* determined a standardized marginal tax rate of 35% (incl. solidarity surcharge and church tax) that referred to a German native as an investor who is absolutely liable for taxation[26]. From now on a differentiation between income from dividends, interest, and capital gains was made in terms of taxation, i.e. interest was taxed at the full marginal tax rate of 35%, dividends at half of the rate (17.5%), and capital gains usually remained untaxed[27]. These changes were incorporated into the valuation calculus by applying Brennan's Tax CAPM.

In May 2007 the Federal Government of Germany voted on a new tax reform act, which was approved by the Federal Council of Germany on July 6, 2007[28]. This new reform brought about the introduction of the settlement tax effective from January 1, 2009 and consequently resulted in another revised version of the standard *IDW S1* effective from April 2, 2008. Due to the reform the half-income system was replaced by the settlement tax, i.e. a definite tax rate of 25% on dividends, interest, and capital gains was introduced. Now, one might propose to reintroduce the lump-sum tax adjustment factor as under the first *IDW S1* in 2000, because all components are taxed equally. But this overall adjustment is only appropriate in the one period case, because the tax rate on capital gains is contingent on the investor specific holding period, whereas interest and dividends are paid each year[29]. In other words, the longer the holding period the lower the effective tax rate on capital gains. Hence, the full definite tax rate of 25% on capital gains has solely to be paid in the one period case. To solve this problem the *IDW* suggests applying an effective tax rate of half the definite tax rate (12.5%), which is confirmed by other empirical findings[30].

It became obvious, that the different tax reforms demanded for several changes of the standard, which in turn led to adaptations of the objectified valuation calculus. Therefore, *Figure 4* shows the different calculi by means of the FTE approach (excluding the perpetuity term) over time[31].

21 Strauch & Wilke, Westfälische Universität Münster, Arbeitspapier 5-1, April 2003, p. 3.
22 IDW, IDW-Fachnachrichten 1997 p. 33.
23 Basic Principles of Business Valuations.
24 Helbling, Der Schweizer Treuhänder 2001 p. 613.
25 Hussmann, Kruschwitz, & Löffler, Die Betriebswirtschaft 1/2002 p. 35.
26 Gelhausen et al., WP Handbuch 2008: Wirtschaftsprüfung, Rechnungslegung, Beratung, item 107.
27 Capital gains remained untaxed as long as the shares have not been sold within a speculative period of one year according to § 23 No. 1 German income tax law.
28 Streitferdt, FINANZ BETRIEB 4/2008 p. 268.
29 Wiese, Munich School of Management – Working Paper 1-35, 2007, p. 1.
30 Zeidler et al., FINANZ BETRIEB 2008, 4 p. 281; The authors state that 14.80% and 13.19% seem to be appropriate and, therefore, 12.50% excluding solidarity surcharge are suggested to be applied.
31 Note: For presentation purposes the calculus is limited to the planning horizon.

Before the half-income system became effective in January 2001 *IDW* suggested the lump-sum adjustment of $(1\text{-}T_P)$, hence two formulas are shown under the first *IDW S1* issued in 2000. However, the half-income system was not translated properly into the denominator under *S1(2000)*. The dividends flowing to the investor were taxed at half of the marginal tax rate, whereas the discount factor was taxed at the full rate. In other words, Moxter's principle of tax equivalence was not met. Under *IDW S1(2000)* this breach of equivalence was known as the tax paradox, i.e. an increasing marginal tax rate leads to higher equity values and to an overvaluation of the respective entity[32]. Following the development of *S1* and therefore having a closer look on the valuation calculus as under *IDW S1(2005)* reveals that the principle of equivalent taxation is almost met. Why almost? Since capital gains were not subject to taxation tax equivalence was given when dividend yields accounted for the total return of the market portfolio, i.e. there were no capital gains. Howsoever, since the latter scenario is as unrealistic as the irrelevance cases stressed above most companies were undervalued under *IDW S1 (2005)* due to a discount rate which was too high and Moxter's principle of tax equivalence which still was not met[33]. With the introduction of the settlement tax the calculus was rearranged ones more under *IDW S1(2008)*. Dividends and interest are now taxed at the definite rate of 25%, whereas the tax rate on capital gains is contingent on the holding period. In other words, the effect of deferred tax payments results in a lower net present value of the capital gain tax burden compared to the net present value of the tax burden when realizing capital gains in each period[34]. The IDW took this effect into account by applying half of the definite tax rate. This adjustment, however, again led to a breach of Moxter's principle of tax equivalence and to an undervaluation, which, nevertheless, in contrast to the previous *S1* is slightly better[35].

Taking all the aforementioned tax reforms into consideration, it can be concluded that adapting the after-tax raw calculus as presented in *Figure 2* on page 189 to a certain tax system is a challenging attempt, which meets its practical constraints. Under the German tax regime these practical constraints led to a breach of Moxter's acknowledged principle of tax equivalence in all three cases. Therefore, the appropriate adaptation of the objectified valuation calculus with respect to the current German tax regulations will remain a task on the agenda of valuation professionals in theory and practice.

IV. An Empirical Analysis of the Tax-CAPM on the German Capital Market

In the course of personal tax adjustments emphasized above Brennan's Tax-CAPM was identified as an adequate approach to reflect the personal tax impact in the valuation calculus. Whether or not the Tax-CAPM as a model with its roots in capital market theory is suitable for objectified business valuations under the German tax regime can be answered through its empirical evidence.

In the empirical literature on the Tax-CAPM most studies deal with the US or UK capital markets[36]. The results achieved range from none significant to significant linear relationships depending on the timeframe and certain components investigated. However, the majority of studies focus on specific topics like the ex-dividend day behavior or the January effect[37]. What is more, the emphasized studies arose from capital market topics and are not linked to the topic of business valuation at all. In this context it is the goal to utilize the empirical findings to derive implications for objectified business valuations. In contrast to the outlined specific areas of research empirical evidence in this paper refers to the question of whether the Tax-CAPM has the ability to explain the realized after-tax returns of shares observable on capital markets or not. In order to answer this question historically realized after-tax yields on stocks have to be compared to ex-post returns that would have been determined by means of the Tax-CAPM at the respective points of time. The latter returns are determined in accordance with *IDW S1 (2005)* since the timeframe investigated covers the era in which the half-income system was effective, i.e. from 2001 to 2008. Given the fact that the determination of the Tax-CAPM returns is in line with German tax law and *IDW* the realized historically after-tax returns have to be those of companies quoted on the German stock exchange. Therefore, it seems applicable to select these companies out of the DAX30 and apply the index as the relevant market surrogate when it comes to the determination of the Tax-CAPM's Beta factor. However, there is a little dispute, which is due to the fact that the composition of the DAX30 is subject to permanent changes. But in order to derive empirical meaningful results the underlying data set has to consist of the same set of companies over the timeframe investigated. This implies that not all companies were members of the DAX30 in each year of the relevant period. What is more, Deutsche Postbank AG and Hypo Real Estate AG are neglected since they were listed in 2004 and 2003 respectively. Hence, the data set consists of 28 companies and 224 data pairs that cover the last eight years under the half-income system.

The first column of each year as presented in *Table 1 on page 193* shows the realized returns per stock after taxes, i.e. the yield on the respective stock less 17.5% of its dividend yield[38]. Referring to the numerator of the formula shown in *Figure 4* under *IDW S1 (2005)* emphasizes how 17.5% are determined when a marginal tax rate of 35% is applied[39].

Following the outlined procedure yields the true after-tax returns for all years[40]. In order to determine the Tax-CAPM's

32 Kruschwitz & Löffler, Die Wirtschaftsprüfung 3/2005 p. 73; Ollmann & Richter, Kapitalmarktorientierte Unternehmensbewertung und Einkommensteuer – Eine deutsche Perspektive im Kontext internationaler Praxis 1999, p. 164.

33 Gampenrieder, Der Schweizer Treuhänder 6/2006 p. 414.

34 Wiese, 2007, Munich School of Management – Working Paper 1-35, 2007, p. 6.

35 Since the paper's focus is on the empirical contribution there is no case included presenting the development of equity values under S1. For such an example please refer to Wegener, Deutsches Steuerrecht (DStR), 19 p. 941.

36 Litzenberger & Ramaswamy, Journal of Financial Economics 1979, 7 p. 163-195; Morgan & Thomas, Journal of Banking and Finance 1998, 22 p. 405-423.

37 Miller & Scholes, The Journal of Political Economy 1982, 90 p. 1118-1141; Keim, Journal of Financial Economics 1985, 14 p. 473-489.

38 Due to the multitude of data points Figure 5 does not show the first two years of the timeframe investigated.

39 The dividend yield in t is determined by dividing the announced dividend for t as per annual general meeting in t+1 by the last share price in t.

40 The returns were determined on the basis of daily returns queried via DataStream.

	2003		2004		2005		2006		2007		2008	
	Historical after-tax Return	Tax-CAPM Return	Historical after-tax Return	Tax-CAPM Return	Historical after-tax Return	Tax-CAPM Return	Historical after-tax Return	Tax-CAPM Return	Historical after-tax Return	Tax-CAPM Return	Historical after-tax Return	Tax-CAPM Return
Adidas	10,74%	20,39%	32,78%	5,36%	33,24%	20,22%	–7,26%	17,05%	–46,40%	–33,28%	–46,40%	–33,28%
Allianz	25,46%	49,39%	–1,04%	8,04%	33,15%	29,88%	22,44%	23,46%	–47,76%	–52,62%	–47,76%	–52,62%
BASF	26,89%	36,26%	22,14%	6,51%	24,48%	28,03%	16,52%	17,53%	–42,70%	–40,43%	–42,70%	–40,43%
Bayer	15,64%	42,25%	9,48%	7,44%	53,09%	28,21%	16,53%	17,62%	–31,90%	–32,44%	–31,90%	–32,44%
BMW	28,80%	35,21%	–8,30%	6,68%	11,37%	20,52%	17,93%	19,61%	–48,48%	–41,97%	–48,48%	–41,97%
Commerzbank	108,72%	42,18%	–1,19%	7,06%	71,87%	27,93%	12,39%	25,22%	–74,71%	–54,86%	–74,71%	–54,86%
Continental	105,00%	23,53%	57,76%	6,98%	59,05%	25,24%	19,05%	23,97%	–67,55%	–30,88%	–67,55%	–30,88%
Daimler	30,47%	37,56%	–1,39%	7,05%	24,50%	29,35%	9,56%	22,38%	–59,34%	–49,95%	–59,34%	–49,95%
Deutsche Bank	52,68%	39,73%	1,55%	7,03%	27,81%	29,99%	27,88%	23,64%	–68,63%	–57,72%	–68,63%	–57,72%
Deutsche Börse	14,77%	13,92%	3,51%	5,26%	98,19%	20,02%	62,05%	22,79%	–61,75%	–45,72%	–61,75%	–45,72%
Deutsche Lufthansa	50,88%	33,78%	–16,39%	7,65%	22,62%	22,31%	70,99%	17,04%	–35,84%	–31,17%	–35,84%	–31,17%
Deutsche Post	67,43%	23,46%	5,90%	6,31%	22,04%	20,92%	12,57%	14,53%	–47,67%	–34,87%	–47,67%	–34,87%
Deutsche Telekom	18,45%	35,54%	18,37%	6,81%	–12,33%	19,08%	2,43%	14,62%	–24,51%	–29,74%	–24,51%	–29,74%
E.ON	39,09%	30,42%	33,54%	5,76%	33,61%	26,81%	19,79%	21,49%	–39,23%	–38,75%	–39,23%	–38,75%
Fresenius	82,00%	10,06%	17,52%	3,49%	45,49%	13,17%	43,98%	16,23%	–34,55%	–18,06%	–34,55%	–18,06%
Henkel	13,38%	15,41%	6,23%	4,98%	30,28%	16,64%	24,31%	12,31%	–45,37%	–26,09%	–45,37%	–26,09%
Infineon	57,65%	43,01%	–27,59%	7,99%	–4,80%	32,53%	37,81%	21,16%	–88,10%	–47,13%	–88,10%	–47,13%
Linde	24,79%	28,59%	10,32%	5,94%	40,46%	23,05%	25,61%	17,80%	–32,37%	–34,24%	–32,37%	–34,24%
MAN	87,33%	33,57%	21,10%	6,86%	56,87%	25,69%	54,27%	26,15%	–65,23%	–50,74%	–65,23%	–50,74%
Merck	32,79%	20,99%	55,38%	5,35%	38,47%	18,02%	12,94%	13,96%	–25,65%	–17,97%	–25,65%	–17,97%
Metro	57,60%	37,02%	18,33%	6,24%	0,19%	19,99%	17,82%	14,83%	–48,93%	–29,17%	–48,93%	–29,17%
Münchner Rück	–10,43%	49,76%	–4,21%	7,09%	27,85%	26,54%	16,62%	19,55%	–13,23%	–28,42%	–13,23%	–28,42%
RWE	31,37%	34,90%	33,88%	6,30%	55,96%	29,53%	37,96%	17,81%	–30,19%	–30,28%	–30,19%	–30,28%
SAP	77,28%	35,44%	–0,65%	7,57%	17,35%	23,96%	6,12%	21,80%	–27,90%	–29,87%	–27,90%	–29,87%
Siemens	59,20%	40,22%	–0,15%	7,52%	16,83%	26,27%	4,67%	23,03%	–50,67%	–47,16%	–50,67%	–47,16%
ThyssenKrupp	51,27%	37,83%	6,56%	7,26%	11,70%	19,48%	104,02%	28,50%	–48,37%	–50,54%	–48,37%	–50,54%
TUI	6,23%	43,76%	9,58%	7,25%	8,41%	21,47%	–15,09%	14,25%	–57,92%	–41,13%	–57,92%	–41,13%
Volkswagen	29,69%	38,92%	–22,63%	6,67%	33,94%	26,29%	92,96%	21,74%	61,26%	–27,82%	61,26%	–27,82%

Tab. 1: Historical realized after-tax returns vs. Tax-CAPM returns from 2003–2008.

quality these returns have to be compared to the Tax-CAPM returns shown in the second column of each year.

As stated before, the Tax-CAPM returns are derived in accordance with *IDW S1 (2005)*. Thus, they are calculated by determining the inner parentheses of the formula shown in the denominator of *Figure 4* on page 191 according to *IDW S1 (2005)*. Since T_P, the marginal tax rate of 35%, is known the remaining factors to be determined are the risk-free interest rate r_f, the Beta factor β_i, the overall return of the market portfolio R_m as well as the dividend yield d_m of the surrogate.

The Risk-free Interest Rate

At first it is the goal to determine the risk-free interest rates before personal taxes for the respective years investigated. Facing an objectified valuation scenario most often the going concern principle of the valuation object is assumed. Therefore and with respect to the equivalence of maturity the risk-free interest rate has to have the same maturity as the valuation object. In other words, the risk-free interest rate has to be of infinite nature[41]. Since there is no bond observable on capital markets, which is infinite in its nature, the Svensson approach as an indirect method has to be applied[42]. The Svensson approach can be regarded as a technique to determine hypothetical zero bonds or spot

41 Gelhausen et al., WP Handbuch 2008: Wirtschaftsprüfung, Rechnungslegung, Beratung, item 287.

42 IDW, Fachnachrichten 2005, 8 p. 556; Dahlquist & Svensson, The Scandinavian Journal of Economics 1996, 98 p. 163-183.

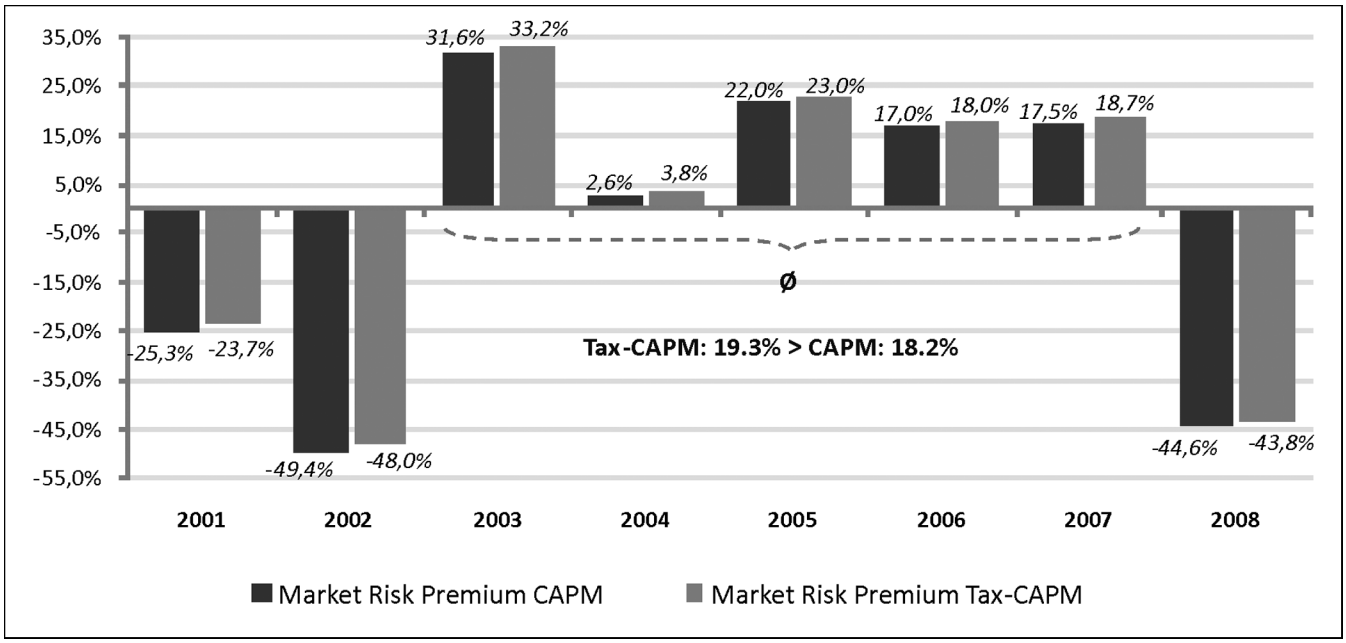

Figure 5: Market Risk Premiums of CAPM and Tax-CAPM from 2001-2008.

rates. A spot rate is a period-specific return of an artificial zero bond, which can be varied in its maturity. Based on the various spot rates calculated by means of the Svensson approach the term structure of interest rates is determined. This term structure shows the relationship between zero coupons and interest rates[43]. There are several input parameters to be queried, which are published by the German Central Bank on a daily basis[44]. Applying the Svensson approach in the course of objectified business valuations would infer that the period-specific cash flows have to be discounted by a discount factor containing a period-specific risk-free interest rate, i.e. determined by means of the Svensson approach at period *t*. In addition the risk-free interest rate for the terminal value calculation has to be determined, i.e. a specific maturity for the spot rates has to be chosen[45]. However, since it is the goal of the underlying section to determine the ex-post Tax-CAPM returns for the respective shares per the end of each year it seems reasonable to apply a maturity of 30 years as suggested by the *IDW*[46]. Moreover, the *IDW* suggests to apply the average spot rate of the last three month and in order to avoid spurious precision to round this average rate to 0.25%[47].

By means of the outlined way of determination the following risk-free interest rates before personal taxes have been calculated as at December 31 of the respective year: 5.50% (2001), 5.50% (2002), 5.50% (2003), 4.75% (2004), 4.00% (2005), 4.00% (2006), 4.75% (2007), and 4.25% (2008). As emphasized in the previous section, within the Tax-CAPM and under the half-income system the risk-free interest rate is taxed at the full marginal tax rate, which leads to the corresponding risk-free interest rates after personal taxes of 3.58% (2001), 3.58% (2002), 3.58% (2003), 3.09% (2004), 2.60% (2005), 2.60% (2006), 3.09% (2007), and 2.76% (2008).

The Beta Factor and Market Risk Premium

The Beta factor is the second component to determine the Tax-CAPM returns and can be regarded as the company's specific risk. As stated before, the DAX30 is the relevant market surrogate and hence the respective Beta factors were determined by dividing the covariance of the respective share and the DAX30 by the variance of the DAX30 for each year.

What is more, to derive the market risk premium after taxes relevant for the Tax-CAPM the overall return of the DAX30 performance index less the taxed dividend yield of the index has to be determined. Due to the changing composition of the DAX30 and with respect to the underlying companies selected the dividend yield was approximated by weighting the company specific dividend yields with their respective market capitalizations per end of the respective year. This resulted in dividend yields of the market surrogate before personal taxes as follows: 1.61% (2001), 2.64% (2002), 1.95% (2003), 2.68% (2004), 2.66% (2005), 2.80% (2006), 2.89% (2007), and 3.90% (2008).

As with the dividends paid by the selected companies the market portfolio's dividends have to be taxed at half of the marginal tax rate and deducted from the overall return of the market to derive the after-tax return of the market portfolio[48]. In a second step the risk-free interest rate after personal taxes has to be deducted from the market portfolio's after-tax returns to determine the market risk premium after personal taxes. *Figure 5* compares the market risk premiums before personal taxes to those after personal taxation from 2001 to 2008, i.e. the CAPM's market risk premiums to those of the Tax-CAPM.

43 Gampenrieder & Wiese, Versicherungswirtschaft 22/2006 p. 1847.
44 Please refer to www.bundesbank.de/statistik/statistik_zeitreihen.php?func=list&tr=www_s300_it03.
45 Gampenrieder & Wiese, Versicherungswirtschaft 22/2006 p. 1847.
46 Gelhausen et al., WP Handbuch 2008: Wirtschaftsprüfung, Rechnungslegung, Beratung, item 291.
47 Wiese & Gampenrieder, Der Schweizer Treuhänder 2007 p. 446.
48 The overall pre-tax returns of the DAX30 are -19.79% (2001), -43.94% (2002), 37.08% (2003), 7.34% (2004), 26.02% (2005), 21.04% (2006), 22.29% (2007), and -40.37 (2008).

Due to the half-income system the after-tax market risk premiums are higher than those before taxes. This contradictory effect is in line with the breach of Moxter's principle of tax equivalence as discussed above; under *IDW S1 (2008)* and the introduction of the settlement tax a step towards harmonization of this effect was achieved.

By means of the different input factors discussed the respective Tax-CAPM returns were calculated as presented in *Figure 5*. On the basis of this data sample it is the goal to address the outlined empirical research questions.

Descriptive Statistics and Regression Analysis

Analyzing the data set from 2001 to 2008 shows 224 values for each of the historically realized after-tax returns, the total returns according to the Tax-CAPM as well as the absolute differences of the two returns. Examining on the absolute deviations of all data points shows a mean of 17.24% and a median of 12.28%. The minimum deviation is observed at Deutsche Börse in 2002 with a value of 0.06%, whereas the maximum is found at Volkswagen in 2008 with a value of 89.07%, which is not surprising due to the share's outperformance. Furthermore, having a closer look on the average realized and Tax-CAPM returns per company from 2001 to 2008 and the respective deviations reveals a mean of 7.92% and a median of 6.14%. The company with the minimum deviation in average is Commerzbank with a value of 0.49%, whereas the maximum still remains with Volkswagen at a level of 27.58%. What is more, with respect to the frequency of occurrence of average deviations it can be stated that there are 6 cases of two digit deviations and another 12 cases of deviations below 5%.

Howsoever, the descriptive analysis of the data set stressed above is not sufficient from a statistical perspective. This means that the values presented above cannot be interpreted as a quality criterion for the Tax-CAPM as a capital market model. In order to properly elaborate on the Tax-CAPM's statistical validity a linear regression has to be conducted in order to test whether or not the two types of return are directed towards a common direction[49]. In the underlying case a test for autocorrelation has to be conducted as a precondition to the linear regression. Facing a data set of 224 pairs over eight years, i.e. 28 pairs per year, involves the risk that the residuals – the deviations – might influence each other. In statistical terms, the residuals are correlating with each other and follow a so-called „snowball-effect", which means that they are either increasing exponentially, or decreasing exponentially, or alternating consistently over time. The autocorrelation analysis conducted revealed that the data is not affected by one of these trends[50].

Finally, conducting the regression analysis by means of the ordinary least squares approach has the goal to determine α_0 and α_1 as being the estimators of the standard linear regression model[51]. The result is a slope of the regression line of 1.102 and a y-axis intercept of 0.032. What is more, since the slope has a significance of 0% at a level of significance of 95% the null hypotheses H_0: $\alpha_1 \leq 0$ is rejected and the alternative hypotheses H_1: $\alpha_1 > 0$ is accepted, which implies that the regression line's slope is significantly greater than 0. To put it differently, with a probability of 95% the slope is greater than 0[52]. Furthermore the adjusted coefficient of determination amounts to 61.2%, which means that the regression model is in the position to explain 61.2% of the variance of the historically realized returns[53]. Compared to econometric or socio-scientific models an adjusted coefficient of determination around 60% seems to be unsatisfactory, but when considering the results of other empirically tested capital market models 61.2% can be regarded as meaningful[54].

By means of the statistical results presented it can be concluded that the Tax-CAPM is capable of explaining the historically realized returns on the German capital market under the half-income system from 2001 to 2008. However, a timeframe of eight years can only give an indication, but no full empirical evidence. The problem researchers face when collecting data under the German setting is a constantly reducing half-life of the respective tax regulations in effect. Therefore, having a data set with an expanded timeframe other problems in terms of comparability would arise.

V. Summary of Findings and Conclusion

After having elaborated on the Tax-CAPM from a theoretical, practical as well as empirical perspective it is the goal to combine these three views and derive implications for the domain of business valuation. Beforehand the results of each subsection are highlighted briefly.

1. Within the first section two groups of thought were introduced, the full- and no-tax-thesis proponents. It was concluded that there is a definite need for the consideration of personal taxes in regard to objectified valuations, because the irrelevance cases of the no-tax supporters are very rare and rather utopian. Moreover, the Tax-CAPM was identified as the prevalent and accepted approach to account for personal taxes.
2. In section two the *IDW* as the only application-oriented standard setter, which accounts for personal taxes in the light of objectified business valuations, was introduced. Especially the way the valuation calculus was adapted over time according to the various tax regulations effective was highlighted. The final issue was that it was not managed under any of the *IDW S1* standards issued to adjust the calculus in a way that all basic principles of business valuation are met. This problem has not been solved yet, because the different components of the Tax-CAPM demand for heterogeneous taxation compared to the relevant taxation of dividends.
3. The last section of the paper elaborated on the empirical evidence of the Tax-CAPM. Therefore data of 28 companies from 2001 to 2008 was collected and the DAX30 as the relevant market surrogate was applied. In a next step

49 Dausend & Schmitt, FINANZ BETRIEB, 3/2006 p. 160.
50 The analysis conducted in PASW Statistics revealed that the coefficients of autocorrelation at a lag of 28 remained within the 95% confidence interval.
51 Heij et al., Econometric Methods with Applications in Business and Economics 2004 p. 80; Fahrmeir, Künstler, Pigeot & Tutz, Der Weg zur Datenanalyse 2004, p. 480.
52 Urban & Mayerl, Regressionsanalyse: Theorie, Technik und Anwendung 2006, p. 147.
53 Hower tested Brennan's Tax-CAPM from 2001 to 2006 applying modified assumptions and yields a coefficient of determination of 43%. Please refer to Hower, Unternehmensbewertung mit dem Tax-CAPM: Fortschritt oder pragmatische Komplexitätssteigerung? 2008, p. 212.
54 All statistical results were determined via PASW Statistics.

a linear regression analysis was conducted; with the ex-post estimated Tax-CAPM returns – according to the regulations under *IDW S1 (2005)* – as the independent variable and the historically realized returns as the dependent variable. With an adjusted coefficient of determination of 61.2% it was concluded that the Tax-CAPM is capable of explaining the historical returns on the German capital market. However, this conclusion only holds true for the period from 2001 to 2008 and does not imply an overall empirical evidence of the Tax-CAPM.

To put the three results obtained in a nutshell it can be inferred that a general dilemma results. From a theoretical point of view, it is obvious that there is a need to adjust for personal taxes in the light of objectified business valuations. Hence the full-tax thesis proponents argue for the Tax-CAPM as the predominant approach to reflect the personal tax impact within the valuation calculus. Furthermore, the underlying statistical analysis revealed that the Tax-CAPM enjoys empirical support on the German capital market. Thus the Tax-CAPM complied with all scientific requirements, i.e. the model can be incorporated into the calculus in a way that a flexible valuation model results, which is independent from any tax regime, and it proved itself empirically. But, on the other hand, certain non-conquerable practical constraints were encountered in the course of adapting the raw after-tax calculus to the German tax setting. These constraints led to the breach of basic business valuation principles and finally led to biased equity values. Therefore, the practitioner's dilemma is the choice of whether neglecting personal taxes, which leads to a theoretical contradiction, or considering personal taxes, which leads to biased equity values with respect to changing tax regulations.

In the underlying context the desire of valuation professionals to obtain more precise and accurate values led to such complex calculi that basic principles of business valuation were ignored. What is obtained at the end of the day is an increase in complexity that comes along with a decrease in accuracy. As good as the Tax-CAPM might be from a theoretical and empirical point of view, there is always the demand for a model to comply with the third – the practical – perspective. As long as this conformity is not given practitioners should adhere to the Standard-CAPM, i.e. the „next better" approach, as a model being in line with all three dimensions discussed above. The applied logic origins from systems theory, which postulates that a prevalent theory explaining a certain phenomenon is acknowledged as being valid as long as an advanced theory free of any contradictions supersedes the old one. This does not infer that the Tax-CAPM is a model of no use; rather the statement implies that, from a conservative-scientific point of view, it is not allowed to favor the Tax-CAPM over the Standard-CAPM in the underlying context.

It might be the case that the above outlined practical constraints as well as the theoretical contradictions are the reasons for other application-oriented standard setters to neglect personal taxes within objectified business valuations. However, these constraints do not legitimate the negligence of personal taxes for evermore; they rather emphasize the need to conduct further research on how to cope with the problem of decreasing accuracy and increasing complexity when considering personal taxes in objectified business valuations.