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Cross-border Intra-group Hybrid Finance and International Taxation

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by

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Abstract:

In intra-group finance hybrid instruments allow for tailor-made form of finance. Hence hybrid finance is often used for international tax planning in multinational groups.

Due to a lack of international tax harmonization or tax coordination qualification conflict can arise. A specific hybrid instrument is classified as debt in one country, and as equity in the other country. This may lead to double taxation. In the reverse case, double non-taxation can arise. Against this legal background one might expect that cross-border hybrid intra-group finance is advantageous in comparison to classical debt finance in case of double-non-taxation while it can be expected to be disadvantageous in the case of double taxation of the yield. Previous studies do not include qualification conflicts. Thus the question arises how qualification conflicts are affecting an intra-group finance decision.

We examine effects of such qualification conflicts, resulting from the use of cross-border, intra-group hybrid finance, on the tax-advantageousness as compared to classical debt finance. The analysis is based on a binomial simulation model including economic and legal uncertainty. We show that the results of our analysis under uncertainty vary significantly when compared to the more obvious results under economic and legal certainty.

Keywords: Hybrid finance, Cross-border intra-group finance, Qualification conflicts, Simulation

JEL-Codes: G32, H21, H25, H26, M41

Contents

1 Introduction

In intra-group finance, the possibilities for a parent company to finance its subsidiary range from equity on the one hand to debt on the other hand, with several hybrid forms of finance in between, combining elements of typical debt with characteristics of typical equity. Examples of hybrid finance are profit participating debt, preference shares, convertibles, or similar instruments. Hybrid instruments are normally very flexible. They allow for tailor-made forms of finance and are thus ideally suited to be used in multinational groups.

Irrespective of balance sheet treatment, hybrid instruments must be classified as either debt or equity for income tax purposes. More precisely, yet on a high level of abstraction: In the source state (the residence state of the debtor) the yield must be classified as either tax-deductible interest expense or as taxable dividend. In purely domestic transactions, where source state and residence state are the same, a coherent treatment is normally guaranteed. In a cross-border situation such coherent treatment is not necessarily granted. It may happen that a qualification conflict arises: a specific hybrid instrument is classified as debt in one country, and as equity in the other country. This may lead to double taxation (or even triple taxation where withholding tax is due and not credited): the yield of the instrument is considered dividend and subject to corporate tax in the source state, and it is considered taxable interest income in the residence state. In the reverse case, double non-taxation can arise: the yield is considered tax-deductible interest in the source state, and it is considered tax-exempt dividend income in the residence state.

Such qualification conflicts can arise as a consequence of lack of tax harmonization or tax coordination. Legal research shows that neither bilateral double tax conventions nor harmonization of tax laws on a European level (Parent-Subsidiary Directive, Interest and Royalties Directive) ensure single taxation of hybrid instruments (Eberhartinger and Six, 2009).

This paper examines the effects of such qualification conflicts, resulting from the use of cross-border, intra-group hybrid finance, on the tax-advantageousness as compared to classic debt finance. The analysis is based on a binomial simulation model including economic and legal uncertainty. We will show that the results of our analysis under uncertainty vary significantly when compared to the more obvious results under economic certainty.

This paper is structured as follows: Section 2 discusses the impact of income taxation on finance decisions, including hybrid finance. Section 3 explains the simulation model for the fiscal framework under uncertainty. Section 4 discusses the results of the simulation and chapter 5 finally provides a summary of the outcome of our investigation.

2 Intra-group cross-border hybrid finance

The influence of taxes on the financing decision has been shown by several studies. According to Modigliani and Miller (1963), the tax-deductibility of interest has contributed to the general preference of debt finance in corporate financing. The research of Miller (1977: 261-75), King (1977) and King and Fullerton (1984) is based on that finding. Robbins and Stobaugh (1972) investigated whether U.S. multinational enterprises prefer financing foreign subsidiaries either with debt or equity provided by either the parent company, another subsidiary or by sources outside the enterprise system. Weichenrieder (2007) has summarized the influence of taxation on the finance decision in empirical research. The studies of DeAngelo and Masulis (1980) or MacKie-Mason (1990) have shown that the benefits in taxation due to a tax shield and loss carryforward substitute each other because interest expenditures just increase an already existing loss carryover. Chowdhry and Coval (1998) have found that a subsidiary's capital structure involving the use of mainly debt or mainly equity appears to be an optimal choice only under the prerequisite of sufficiently different tax rates in both countries. Further, Bradley et al. (1984), Givoly et al. (1992), Hovakimian et al. (2001), and Goldstein et al. (2001) elaborate on the optimal capital structure. Graham (1996, 1999, 2000, 2003), Shum (1996), Gordon and Lee (2001) and Gropp (2002) have illustrated the positive connection between tax rates and debt ratios. By using panel data on Italian companies, Alworth and Arachi (2001) provided strong empirical evidence for the cross sectional impact of both personal and corporate tax on the decision for debt financing of companies. On the basis of a large sample of European firms Huizinga et al. (2008) have emphasized that a firm's leverage depends on national tax rates as well as international tax rate differences and that the relationship between leverage and international tax rate differences thus reflects the presence of international debt shifting.

In spite of numerous research results on tax and finance in general, research on tax and hybrid finance is rare. Some legal research has recently been published (among others Eberhartinger and Six 2009; Six 2008; Wiedermann-Ondrej 2007), but empirical evidence is hardly available: data-bases are not adequate as they either do not give information on hybrid finance and/or as they include consolidated statements only, which by nature do not show intra-group finance. Discussion with consultants shows that in specific cases, for specific enterprises, hybrid finance is used and large tax savings are achieved. By choosing an analytical approach, the paper adds to existing research and gives novel insights into the advantageousness of hybrid finance as compared to debt finance.

In general, national and international tax law distinguishes between equity and debt financing. Accordingly, the returns for capital invested are either dividends or interest. At the debtor's level, interest expense is normally tax deductible, whereas dividend is paid from taxed income. At the creditor's level, interest income is normally taxable, and for dividend income frequently a shareholder relief applies.

Hybrid financial instruments (mezzanine finance) incorporate elements of both equity and debt. Consequently, they cannot be conclusively classified as either equity or debt. The spectrum of hybrid financial instruments ranges from corporate shares with features typical for debt to loans with features usually associated with equity investments. Broadly spoken, hybrid financial instruments are often formed by adding certain elements of equity instruments to debt instruments. They include inter alia silent partnerships, participating bonds, convertible bonds, warrant bonds, profit participation loans and preference shares. The advantage of hybrid financial instruments is the flexibility to tailor an instrument exactly to the needs of the investor or the issuer. For example, lenders can share in profits which basically would benefit the shareholders. Also, shareholders can cut their risks and benefit from protections traditionally granted exclusively to lenders (Wiedermann-Ondrej 2007: 4-5). Hybrid financial instruments also attempt to capitalize on tax advantages of debt without bearing its disadvantages. They can be structured in order to achieve a debt treatment for tax purposes but an equity treatment for accounting purposes, which eventually results in a cut in taxes but not in a decrease in the creditworthiness of a corporation (Wiedermayer 2001: 337).

In financial accounting there are several possibilities to show hybrid instruments in the balance sheet (Bertl, 2005). However, it is difficult to clearly match some hybrid instruments to either equity or debt for tax purposes. Nevertheless, a definite classification in tax law into equity or debt is crucial because both equity and debt are treated completely differently in income and corporate tax.

In a cross-border context, not only the qualification in the two countries involved is relevant; additionally the treatment of hybrid instruments in bilateral double tax treaties between two countries is essential. The relevant articles in double tax treaties concerning the returns on hybrid instruments are, according to the OECD-MC, Article 10 (dividends) and Article 11 (interest). Even though both articles attribute an unlimited right to tax the income received to the recipient state, they do not deny the source state's right to tax the income by levying withholding tax either, at a level of 5, 10 or 15%. In order to avoid double taxation, the state of residence in turn is obliged to credit the withholding tax against the corporate tax levied by the state of residence. However, regarding a possible qualification conflict, double tax treaties are only rarely helpful (Six 2008). They do not ensure parallel qualification in the two states involved; at the most they open the way for a mutual agreement procedure (Helminen 1999: 273-4), or they apply subject-to-tax rules that rule out double non-taxation.

Also within the European Union, only little guidance in case of a qualification conflict can be found. Two Directives harmonize taxation in case of intra-European group finance: the Parent-Subsidiary Directive (PSD)(90/435/EEC) and the Interest and Royalties Directive (IRD)(2003/49/EC). Both Directives still leave room for Member States to in- or exclude certain hybrid instruments from the benefits of the Directives (Eberhartinger and Six 2009: 14).

As a result, qualification conflicts of hybrid finance are not solved by the existing measures of tax harmonization and coordination. There is still room for inconsistent qualifications of hybrid instruments in international tax law. From a governmental viewpoint, neither double taxation nor double non-taxation is desirable. For multi-national corporations (MNC), at least the latter case is advantageous and a constant source of international tax planning (Jacobs 2007: 1327-8). The best results for corporations would be achieved if a hybrid instrument is classified as debt in the subsidiary's state of residence and as equity investment in the parent company's state of residence, assuming certainty with regard to economic performance and legal qualification. Accordingly, the subsidiary's income would be reduced by interest expenditures from the hybrid instrument. At the parent's level, the yield received would be classified as dividend and possibly be exempt from tax. The result would be a double non-taxation of income. In case of a contrary qualification conflict (qualification as taxable dividend in the subsidiary's state and as taxable interest income in the parent's state), income would be taxed twice.

This qualification uncertainty is a disadvantage of hybrid finance instruments because tax qualification of classic debt financing can be assumed to be sure. So from the group's point of view, setting up classic debt finance guarantees single taxation of the yield. Hybrid finance in contrast combines the chance of non-taxation and the risk of double-taxation. So it is to be expected that qualification conflicts influence the advantageousness of an instrument substantially.

Results on the advantageousness of (hybrid) finance change when the assumption of economic certainty no longer applies, and when thus asymmetric taxation of profits and losses is included. If the finance decision under economic uncertainty leads to different or even worse results than the finance decision under economic certainty, tax planning under the presumption of economic certainty would lead to substantial mistakes, especially in cases of cross-border hybrid finance. In a more realistic scenario, (variable) interest payments would not immediately reduce a company's tax burden. They may create or increase a loss carryforward. Moreover, interest would increase the parent company's earnings and contribute to a higher total group tax burden. In this situation, hybrid instruments classified as debt would be unfavourable, and even more so if the annual loss-offset is restricted as it is the case in many tax systems. For this setting, equity finance would be favourable to debt finance and to hybrid finance. This is true not only if the tax rates of both countries are equal (Eberhartinger and Pummerer, 2009), but also if the tax rate in the subsidiary´s country is higher (to a reasonable degree) than in the parent´s country of residence (Eberhartinger and Pummerer, 2010). Both studies assume that a hybrid instrument is qualified equally as debt in both countries involved. In the latter case, the disadvantage of asymmetric taxation is not offset by the advantage of variable yield in combination with an advantageous tax-rate relation.

Against this legal background one might expect that cross-border hybrid intra-group finance is advantageous in comparison to classic debt finance in case of double-non-taxation, while it can be expected to be disadvantageous in the case of double taxation of the yield. Previous studies do not include qualification conflicts. Thus the question arises how qualification conflicts affect an intra-group finance decision. Hence, in the following we explore if and to which extent economic uncertainty and qualification uncertainty influences the advantageousness of hybrid in comparison to classic cross-border intra-group finance.

3 Description of the research model

As described above, we include asymmetric taxation of profits and losses under economic uncertainty, which is a key feature of tax regimes. In order to determine the actual tax burden, information on preceding periods is required. We base our analysis on a simulation model which allows capturing the effects of asymmetric taxation of profits and losses, in contrast to closed models.

The model is subject to several restrictions: we focus on a 100% parent-subsidiary relation, both corporations subject to corporate tax. The hybrid instrument that we consider offers a yield which is tax-deductible and which depends on the result of the subsidiary. We do not include withholding tax, assuming that any withholding tax will be credited to the parent's corporate tax. Neither do we include aspects of (dis-) advantageousness resulting from different tax rates in the two countries involved, in order to fully focus on qualification conflicts.

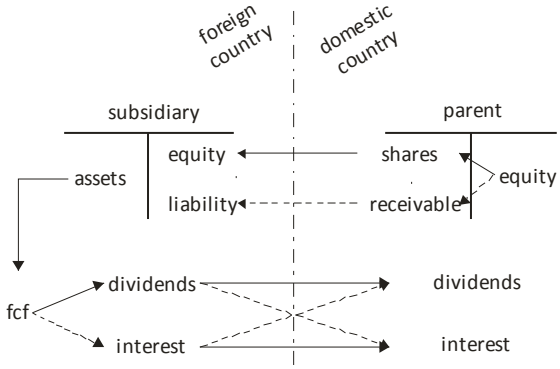
The basic idea of the approach is simple: We define a pre-tax world in which investors carry out different risky investments. In spite of specific characteristics of each possible investment, investors are indifferent to all investments, although risks may vary. In this context one can distinguish between two basic types of investors, namely the risk-averse investors and the risk-neutral investors. In order to provide a simple analysis we decided to focus on risk-neutral investors. If we focused on risk-averse investors, the model would have to be expanded by a utility function. We will discuss in detail the advantages of assuming risk-neutral investors for our analysis later.

In a first step, the setup of the model is illustrated by introducing the corporate group our analysis is focused on. Subsequently, we will elaborate on the integration of economic uncertainty in the model. In a next step, we will discuss our approach on how to implement qualification conflicts and legal uncertainty in our model. Finally, we will define an indicator which enables us to measure the effects of intra-group hybrid finance. We generally intend to emphasize the model's structure by substituting a formal presentation by a graphical illustration.

3.1 Corporate group

Our analysis focuses on a multinational group consisting of two corporations resident in two different countries. The residence state of the parent company is referred to as domestic country, the resident state of the subsidiary is referred to as foreign country. In order to label each country, we will use the subscript *D* for domestic and *F* for foreign. Figure 1 illustrates the group we focus on.

Figure 1: Modelling the multinational group



The parent company's investors set up the parent corporation by financing it entirely with equity. The parent invests its assets in the 100% subsidiary. Thus, the parent´s investment decision is restricted to whether the subsidiary is to obtain additional equity or additional debt (hybrid finance of the subsidiary will be introduced in a later step.) Irrespective of that decision, the parent company will always own 100% of the subsidiary's shares. In order to be able to analyse the full theoretical framework affecting the subsidiary's financing, we neglect any thin capitalization rules or minimum equity ratios. Therefore, even an equity-ratio of zero during the subsidiary's start-up period is possible.

The subsidiary invests all capital received by the parent in assets to carry out a risky business. In order to keep the model simple, we assume that the subsidiary's investment cash flow equals its depreciation. Hence, the subsidiary's assets should remain constant over time in the absence of economic uncertainty. However, in any period the subsidiary's return on assets is determined by economic uncertainty. Thus the return on assets could either be positive or negative. The expected return on assets is defined to be constant over time. The modelling of the relationship between risk and return on assets is discussed in section 3.2.

If the subsidiary in one year generates a profit, it is either reinvested in the subsidiary or distributed as a dividend to the parent company. Since our intention is to analyse the effects resulting from intra-group finance, the various possible scenarios the subsidiary has to deal with may of course also result in a difference in the amount of the annual repatriation. Hence, according to our assumption, a fully equity-financed subsidiary only distributes dividends if a commercial profit after accounting for loss carryforwards is achieved. In contrast, a fully debt-financed subsidiary pays unconditional fixed

interest in any period. These unconditional payments are limited by the subsidiary's possible bankruptcy.

In our model a loss equals a negative free cash flow. To avoid the subsidiary's bankruptcy a certain amount of assets is sold in the loss period. Since the return on assets remains constant over time, a prior loss increases possible future profits or losses accordingly. In case a positive free cash flow is generated and no dividends are distributed, the subsidiary gains value. In subsequent periods, the application of the uncertain return on assets leads to increased profits or losses. These attributes are essential when discussing the effects of taxation in this environment.

However, besides taxation also the financing decision is a binding advance repatriation decision. Accordingly, at least two approaches in the model's context can be taken into account:

- The subsidiary's profit can be reinvested in the subsidiary. Accordingly no dividends are distributed. Interest payments by the subsidiary are immediately compensated for by the parent company. From an economic point of view this would make little sense. Thus, if the parent compensates the subsidiary for any interest payments, it would have been reasonable to finance the subsidiary with equity right from the start. However, to finance a subsidiary with debt may still result in tax advantages for the group of companies.
- The subsidiary's profit can be transferred to the parent company. In case of equity financing the subsidiary's total commercial profit is distributed as a dividend to the parent company. Hence, in profit periods dividends and interest are paid to the parent. In contrast, in loss periods only interest is paid to the parent.

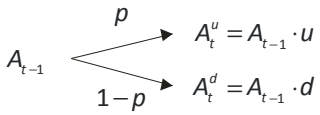
Both alternatives limit the effects of binding advance repatriation decisions due to the specific design of the intra-group finance. Because we consider the latter option to be more realistic from an economic point of view, we assume full dividend distributions by the subsidiary. As we will show in the following section, the expected rate of return for investments in the subsidiary and the parent are equal in our model. This specific feature of our approach for modelling economic uncertainty limits the economic effects of the repatriation decision in a pre-tax world.

3.2 Integrating economic risk

As outlined above, the group tax burden is a function of both the intra-group finance and the subsidiary's economic risk. In order to analyze the effects of intra-group hybrid finance under economic risk, the model must allow the variation of risk in accordance with the investment's expected rate of return.

A binominal-model suffices to account for uncertainty. At any time t there are only two future outcomes in t+1. The assets A at time t depend on the return on assets realised in the respective period:

Figure 2: Modelling economic uncertainty



It depends on both the returns (*u,d*) and the probability measure *p* whether the investment in time *t*-1 meets the investor's estimate. The continuously compounded expected return on assets is, according to Figure 2

$$E(r_A) = \ln\left(\frac{A_{t-1} \cdot u}{A_{t-1}}\right) \cdot p + \ln\left(\frac{A_{t-1} \cdot d}{A_{t-1}}\right) \cdot (1-p) = \ln(u) \cdot p + \ln(d) \cdot (1-p). \quad (1)$$

In financial literature (*Hull* 2005: 245) *u* and *d* are referred to as

$$u = e^{\sigma}; d = e^{-\sigma}. \quad (2)$$

The term σ represents the volatility of the return.

According to our research focus, it is reasonable to assume that the expected rate of return is independent of any risk. So

$$E(r_A) = \ln(u) \cdot p + \ln(d) \cdot (1-p) = e^{r_f} \quad (3)$$

must hold. If *u* and *d* in (3) are substituted according to (2), (3) results in

$$p = \frac{e^{r_f} - d}{u - d}. \quad (4)$$

The probability in (4) is usually referred to as Martingale Measure (Glassermann 2003; 37). Under this probability measure, the expected rate of return is not a function of risk. On the one hand, increasing risk causes a higher return in case of an up- or downward move, on the other hand the increasing return is exactly compensated for by the decreasing probability of an upward move.

If investors do not demand risk compensation, they are considered risk neutral. The assumption in (3) may be considered as unrealistic since investors are usually risk averse. However, the assumption of risk-neutral investors is a common approach to analyze effects of taxation (Bradley et al. 1984; Chowdhry and Coval 1998, Green and Hollifield 2003). It does not substantially limit our analysis for the following reasons:

- We are not developing a general valuation model. Our focus is to determine a terminal value under economic uncertainty. Hence the assumption of volatile returns seems to be more important than modelling the probability for various kinds of investors.
- From a technical point of view, risk-neutral investors seem to be better suited for our analysis of tax effects because repatriation decisions in a pre-tax world would have no impact on the terminal value of the group at all. For this reason, the intra-group financing decision does

not affect the terminal values in a pre-tax world. This in turn would not apply to risk-averse investors in case parent and subsidiary are not perfectly correlated. The assumption of risk-neutral investors ensures that all differences in the terminal values result from taxation. This allows isolating the tax effects.

- Financing a subsidiary with debt may eventually result in the subsidiary's bankruptcy. However, in a pre-tax world bankruptcy would not affect the expected terminal value of the group because, due to the assumption of risk-neutral investors, the expected return would be the same for the parent and subsidiary. So the simplifying assumption of risk-neutral investors ensures even in case of bankruptcy that the terminal group value is independent of the design of the intra-group finance.
- The tax effects derived from a risk-neutral model may eventually show a trend for risk-averse investors, because changing to a different (individual) probability measure in order to compute the expected terminal value (and its distribution) does not result in reversed results.

The characteristics of our underlying model according to the assumptions are illustrated in Figure 3 for $\sigma = 20\%$ and $\sigma = 50\%$.

Figure 3: Modelling economic uncertainty

The higher the volatility, the higher the risk, and thus the higher the return in a positive scenario and the higher a loss in the negative scenario, respectively. If the probabilities remained constant, the expected return would increase with increasing risk. However, assumption (3) guarantees that the effects of increasing returns are compensated by the change of probabilities. So, in other words, increasing risk is connected with an increasing span between the assets after a positive or negative movement.

Next we discuss how a hybrid financial instrument must be designed to compare to a conventional debt instrument in this model environment.

3.3 Unconditional vs. conditional variable yield

As discussed above, typical debt financing may lead to an increase in the subsidiary's loss carryforward, whereas interest payments are subject to tax at the parent company. However, in case of a hybrid debt instrument the interest payment is subject to economic uncertainty and depends on the subsidiary's economic performance. That is why it may be reasonable to define variable interest as a percentage of the period profit. Accordingly, in case of a subsidiary's loss, the disadvantage of a pos-

sible non-deduction in the foreign country and simultaneous taxation in the domestic country could be avoided.

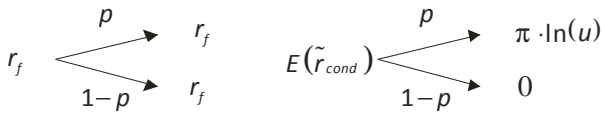
A prerequisite for analysing tax effects of hybrid instruments is to define the hybrid instrument in a way that investors would be indifferent if confronted with the possible investment alternatives "classic debt finance" and "hybrid finance" in a pre-tax world. In reality, hybrid instruments with variable yield are often featured with a minimum (floor) and maximum interest rate (cap). We consider an instrument with a floor of zero as appropriate, but we do not include a negative floor.

Since we assume risk-neutral investors the interest rate of classic debt is the risk-free interest rate. This assumption may be considered inappropriate if debt has a default risk unequal to zero. However, since we discuss an intra-group finance contract the default risk can be neglected, because the parent company

- is affected by the subsidiary's economic risk in any case, independent of the intra-group finance decision, and
- will definitely not have to file for bankruptcy because of intra-group interest payments.

Due to these arguments we consider a riskless interest rate which is independent of the subsidiary's risk as a useful assumption for our analysis. As far as the possible bankruptcy of the subsidiary is taken into account, even the unconditional interest payment, i.e. the subsidiary's obligation to constantly pay interest, is risky. Hence only the obligation to constantly pay interest is unconditional. The difference between these alternatives is illustrated in the following figure.

Figure 4: Unconditional vs. conditional interest payments



If the expected interest rate of the hybrid instrument is to be equal to the risk-free interest rate, then

$$r_f = \pi \cdot p \cdot ln(u) \text{ with } u = e^{\sigma} \tag{5}$$

must hold. Substitution and rearrangement leads to

$$\pi = \frac{r_f}{p \cdot \sigma}. \tag{6}$$

The variable π is the fraction of the positive return that has to be agreed on as variable yield when setting up a hybrid instrument.

Since the assets depend on the subsidiary's economic performance, the realized yield may differ over time although the same expected interest rate is applied. This does not affect the group terminal value in a pre-tax world because the expected rate of return is equal for both parent and subsidiary.

3.4 Taxation of earnings

To integrate taxation into the model we interpret the change in asset values as earnings before interest and taxes (EBIT). Hence tax payments reduce the assets that can be deployed for the next period. Even if the expected return on assets remains unchanged, future profits and losses are lowered by taxation.

According to Figure 1, in case of a possible qualification conflict, yield payments by the subsidiary to the parent can be qualified as interest payment or as dividend, both in the parent's country (domestic) and in the subsidiary's country (foreign). For integrating qualification conflicts in our model we introduce a dummy variable $q_{domestic/foreign}$ for the situation under consideration. Since both fiscal authorities can qualify yield as interest or dividend, four constellations must be distinguished:

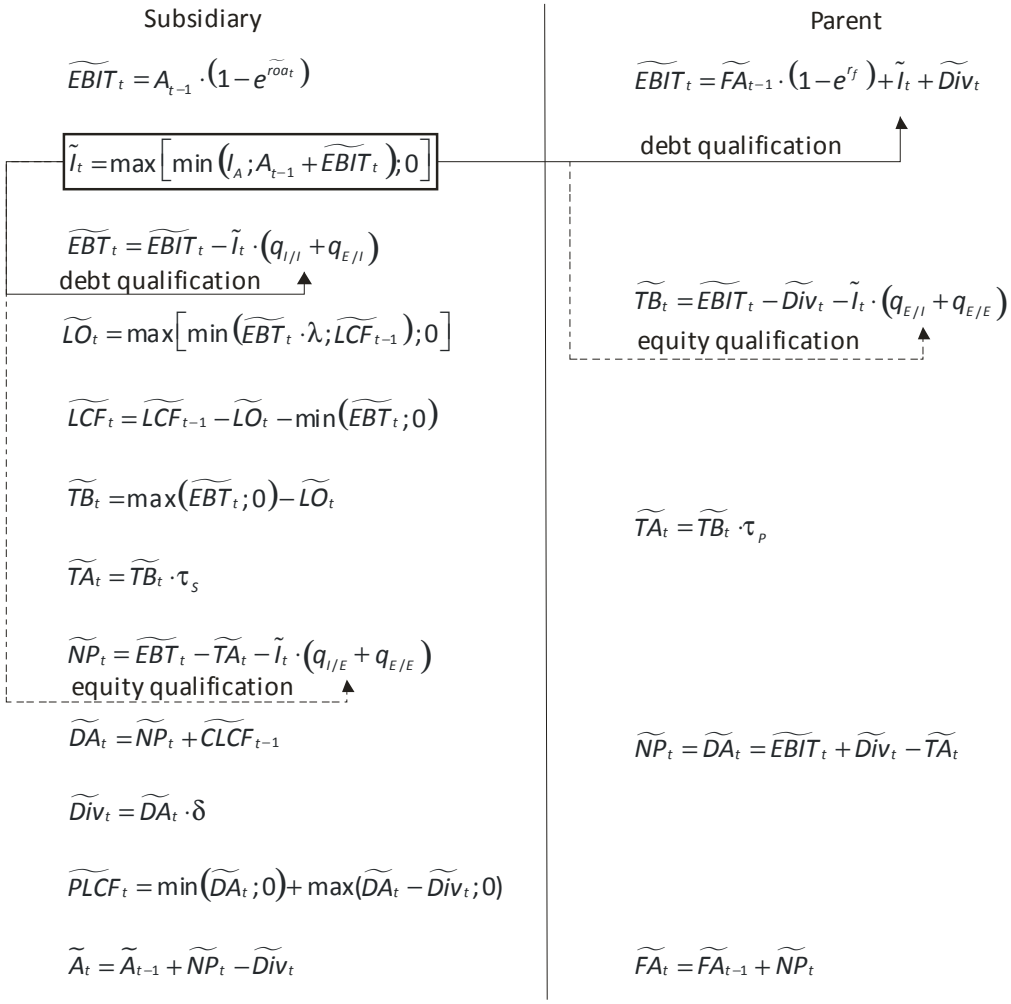
- $q_{I/I} = 1$: The domestic and the foreign fiscal authority qualify the yield as interest.
- $q_{E/I} = 1$: The domestic fiscal authority in the parent's country of residence considers the yield as dividend while the foreign fiscal authority qualifies the yield as interest.
- $q_{I/E} = 1$: The domestic fiscal authority considers the yield as interest while the foreign fiscal authority qualifies the yield as dividend.
- $q_{E/E} = 1$: Both fiscal authorities consider the yield as dividend.

Due to the fact that only one of these situations can occur, $q \in [0,1]$ and $q_{I/I} + q_{E/I} + q_{I/E} + q_{E/E} = 1$.

For classic debt financing $q_{I/I} = 1$.

The subsequent figure illustrates how the group terminal value is developed over time when taxation is taken into account.

Figure 5: Developing terminal value



Subsidiary:

The subsidiary's *EBIT* is calculated by multiplying the value of its last-year capital by its current return on assets.

In our model, fixed or variable interest (*I*), as the case may be, has to be paid periodically by the subsidiary. In case the subsidiary has lost a big part of its capital, it may not be able to pay the full amount of interest, if any at all. Thus, in a first step a min-function calculates if the periodic interest payment exceeds the remaining capital plus the *EBIT*. The max-function outside the brackets ensures that interest payments cannot be negative.

The deduction of interest expense (fixed or variable) from *EBIT* leads to the subsidiary's earnings before tax (*EBT*). We assume that yield, once qualified as interest, is not subject to any further restrictions on its tax deductibility such as thin-capitalization rules or shareholder debt financing rules.[1]

[1] Our model captures most of these restrictions as well; however, this is not the focus of our study and would require a different interpretation of the results.

As a result of the risky business activities of the subsidiary, it can also generate losses. Accordingly and in compliance with most tax systems worldwide, current *EBT* can be offset against losses from prior periods. The annual loss offset (*LO*) is limited by the amount of the existing loss carryforward from previous years on the one hand, and, if applicable, by a percentage λ of current *EBT* that may be offset at maximum. This latter restriction is prevalent in some countries (such as Germany or Austria). If this restriction does not apply, λ equals 1. We exclude loss carryback from our analysis – it is not frequently found and usually limited in time and amount.

The loss carryforward (*LCF*) in a year is therefore reduced by its use in a year, and/or is increased by remaining losses which cannot be offset in the current year.

The annual tax amount payable (*TA*) results from the tax rate (τ) times the annual tax base (*TB*), which results from subtracting offset losses from current positive *EBT*. Yield for a hybrid instrument that is qualified as equity does not reduce the tax base. It does reduce, however, the net profit (*NP*), which is the *EBT* minus the tax payable minus the respective dividend-like yield.

For our model, we assume that distributable profit and taxable profit are determined on the same basis, which is the *EBT*. We assume further that profit distribution restrictions follow the continental European model: dividend payments are possible only if there is a (commercial) net profit, and only to the extent the (commercial) net profit exceeds the loss carryforward from previous years. The distributable amount (*DA*) therefore equals the net profit less the loss carryforward; the actual distribution (*Div*) is a quota (δ) of the distributable amount. The value of the subsidiary's assets at year-end is calculated by adding the current net profit and subtracting current dividend distribution to the value of the previous period's assets.

Parent:

In the first period the parent transfers its entire equity to the subsidiary as subsidiary's equity or debt or hybrid finance. Hence the parent receives interest income and, if applicable, also dividend income from the subsidiary. The interest income it receives is included in all cases: fixed interest or variable yield, qualified as interest or as dividend income for tax purposes. From the second period on, the parent's *EBIT* is composed of interest/dividend/hybrid yield from the subsidiary and of its earnings generated via an investment of its funds (income from the subsidiary from the previous years).

We assume that the parent enjoys full dividend relief. This means that its tax base excludes dividend income as well as income from variable yield from hybrid finance which is classified as dividend in the parent's country.

As shown in the equations, we exclude any kind of group taxation or consolidated tax base from our analysis.

3.5 Modelling tax uncertainty

Legal uncertainty is usually discussed in the context of unclear future tax legislation. However, we address a modified kind of legal uncertainty. We focus on the taxpayer's uncertainty on how tax authorities qualify the realised intra-group finance, which includes but is not restricted to future changes in tax law.

For our analysis we consider the situation that the group agreed on intra-group finance in the past. At the time of decision-making, the final qualification by fiscal authorities is uncertain. The qualification of the intra-group finance is revealed in a tax audit at the end of the ten-year observation period. From our point of view this is a realistic and useful assumption since most countries have not established an advance ruling up to now.

For classic debt financing, qualification conflicts are unlikely. When setting up a hybrid debt finance instrument the situation may be different. The legal situation may differ in countries and additionally fiscal authorities have significantly more latitude of discretion, due to the unclear legal situation.

The basic problem for decision makers in the context of qualification conflicts is illustrated by a simple example. Let's assume that an interest payment of 10 is agreed on. The marginal tax rate should be 25% for both countries. The probability that the domestic fiscal authority in the parent's country qualifies the yield as dividend is p_{de}, and the probability for qualifying the yield as interest is $p_{di} = 1 - p_{de}$. Accordingly, the foreign fiscal authority in the subsidiary's country qualifies with probabilities p_{fe} and $p_{fi} = 1 - p_{fe}$. The probabilities in the two countries are independent of each other: we assume that countries rely on their own judgement and their own legal framework only, so there is no (or at least no successful) bilateral exchange of information.

When fiscal authorities are completely uncertain about how to qualify the instrument, each qualification probability is 50%. Thus, legal uncertainty is at a maximum.

Figure 6: Modelling tax uncertainty

qualification	TA_f	TA_d	p_i	$TA_f + TA_d$	$E(TA)$	σ^2_{TA}
E/E	2.50	0.00	25%	2.50	0.63	0.00
E/I	2.50	2.50	25%	5.00	1.25	1.56
I/E	0.00	0.00	25%	0.00	0.00	1.56
I/I	0.00	2.50	25%	2.50	0.63	0.00
			100%		2.50	1.77

As can be seen from the graph there is a range from non- to single- to double-taxation depending on the hybrid instrument's qualification. Since the situation of double taxation is as probable as double non-taxation, the disadvantages are exactly offset in this example. The expected tax payment is then 2.5, in spite of a possible qualification conflict. But legal uncertainty as defined above changes the risk of the tax claim. Without a qualification conflict the standard deviation is zero. In our example,

with a qualification conflict, the standard deviation of the tax claim is 1.77. Hence, risk-neutral investors would judge each tax claim equally, but risk-averse investors would not, as they would be more affected by a possible qualification conflict. So the results derived in our example underestimate the effects from a risk-averse investor's point of view.

Consequently, double taxation scenarios could be considered a quantitative obstacle for employing intra-group hybrid finance. In the following, our results suggest that this would be a misleading interpretation.

Given that the probabilities for the two different fiscal authorities to qualify a yield as either dividend or interest are uncorrelated, infinite combinations of the probabilities may occur. Nevertheless, our analysis requires a connection between the decisions of fiscal authorities.

Our goal is to explore the influence of qualification conflicts on the advantageousness of a hybrid finance instrument. As can be seen in Figure 6, the taxpayer of course prefers double non-taxation. In case no qualification conflict occurs, the use of hybrid finance is riskless. This requires

$$p_{de} = 1 \; and \; p_{fi} = 1 \tag{7}$$

to be true. To analyze the effects of qualification conflicts we assume that the probabilities of both domestic and foreign fiscal authorities are linked according to

$$p_{fe} = 1 - p_{de} \, . \tag{8}$$

Values for the probabilities according to this assumption are summarized in the following table. The probability p_{de} is then exogenous, while all other probabilities are endogenous.

Figure 7: Decision probabilities of fiscal authorities

p_{de}	p_{di}	p_{fe}	p_{fi}
0%	100%	100%	0%
10%	90%	90%	10%
20%	80%	80%	20%
30%	70%	70%	30%
40%	60%	60%	40%
50%	50%	50%	50%
60%	40%	40%	60%
70%	30%	30%	70%
80%	20%	20%	80%
90%	10%	10%	90%
100%	0%	0%	100%

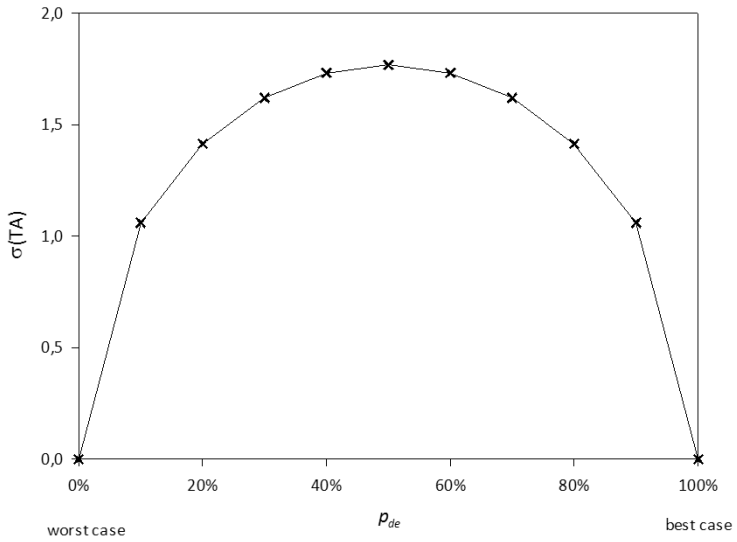
Varied probabilities p_{de} can under these assumptions be interpreted in a way that

- $p_{de} = 1$ leads to reliable double non-taxation (best case).
- an increasing probability p_{de} causes a move away from best case to worst case.

- $p_{de} = 50\%$ implies the maximum of legal uncertainty.
- $p_{de} = 0$ leads to reliable double taxation (worst case).

In other words, $p_{de} = 1$ definitely leads to the best case, while $p_{de} = 0$ definitely leads to the worst case. The standard deviation of the tax claim of the example above, as a representative for qualification uncertainty, is illustrated in Figure 8.

Figure 8: Standard deviation of tax claim in case of qualification conflict



We analyse the advantageousness of a hybrid instrument, depending on the probability that the favourable scenario can be expected, by varying the probability that the domestic (parent's) fiscal authority qualifies the yield as dividend.

3.6 Measuring effects of taxation

Based on the different intra-group finance decisions, we derive different terminal values of assets for the whole group for t_{10}. In the pre-tax binomial model, after ten years 11 different outcomes are observable. Overall, 1024 paths lead to these 11 outcomes.

In the pre-tax world it does not matter which path leads to an outcome in t_{10}. Taking taxes into account the specific path matters. When a profit in the first year is followed by a loss in the second year, taxes are levied in the first year, while in the second period (normally) a loss carryforward is granted instead of negative tax. In the opposite case, the company ends up with a different terminal value after two periods: the tax base of the second period is reduced by a loss offset.

As explained above, taking asymmetric taxation into account requires a simulation approach, which needs a limited observation period. Our observation period is ten years. At the end of this period a loss carryforward generated during the ten years may occur. These loss carryforwards may be of value because they may reduce the future tax burden. A standard assumption in tax literature is to account for existing loss carryforwards by computing a global tax shield γ that should be assigned to

the loss carryforward. According to past empirical results, γ is estimated to be 40% (Schneider 1988: 1222). This estimate includes a discounting effect and a risk component.

In contrast to this simplifying assumption we integrate existing loss carryforwards taking into account that

- high loss carryforwards mainly occur when over the years the assets of the subsidiary were almost lost due to economic risk. Return on assets is assumed to be constant. So in situations with a high loss carryforward it takes rather long to benefit from a tax reduction, even when a longer period with profits follows. Due to this long time period needed to generate a tax shield from the loss carryforward, the present value of the tax reduction is relatively low.
- riskier entities more likely accumulate a loss carryforward. If it is likely that loss carryforwards are generated by the future activity itself, then it is unlikely that loss carryforwards generated in previous periods can induce a future tax reduction.

The valuation of a loss carryforward as suggested in literature does not cover these effects. This results in an overassessment of loss carryforwards at the end of the observation period. To avoid this overestimation we cut the valuation by increasing the inherent risks and decreasing the value of the assets. According to previous simulation results, an exponential cutting function seems to be appropriate:

$$\chi_i^A = \begin{cases} e^{-\frac{\tilde{A}_{i,10}}{\widetilde{LCF}_{i,10}}} \text{ for } \widetilde{LCF}_{10} > 0 \\ 0 \text{ for } \widetilde{LCF}_{10} = 0 \end{cases} . \tag{9}$$

If all assets were lost during the first ten years (e.g. by bankruptcy), an existing loss carryforward is worthless, and the value of the cutting function is one. In other words, 100% of a loss carryforward are cut due to the fact that no or only little future profits can be generated by applying the constant return on assets.

Independent of the assets, the value of LCF in t_{10} must depend on the risk of subsidiary's activity. This effect is covered by the subsequent cutting function. In order to reduce the global valuation of loss carryforwards regarding the risk of the activity, we use the following expression:

$$\chi_i^\sigma = e^{-\sigma} . \tag{10}$$

When we calculate the group terminal value we measure already existing loss offsets in t_{10} according to

$$\widetilde{VLCF}_i = \widetilde{LCF}_{i,10} \cdot \gamma \cdot \left(1 - \chi_i^A\right) \cdot \left(1 - \chi_i^\sigma\right) \cdot \tau_s . \tag{11}$$

These assumptions lead to the following overall terminal value

$$E\left(\widetilde{GTV}\right)=\sum_{i=1}^{1024}\left(\widetilde{A}_{i,10}+\widetilde{FA}_{i,10}+\widetilde{VLCF}_{i,10}\right)\cdot p_i\ . \tag{12}$$

In case of intra-group hybrid finance a group terminal value is calculated for all four different qualification constellations. Depending on the qualification probabilities, the terminal value is the expected value of the four different terminal values:

$$E\left(\widetilde{GTV}^{hf}_{\tau,10}\right)=\widetilde{GTV}^{hf}_{I/I}\cdot p_{I/I}+\widetilde{GTV}^{hf}_{E/I}\cdot p_{E/I}+\widetilde{GTV}^{hf}_{I/E}\cdot p_{I/E}+\widetilde{GTV}^{hf}_{E/E}\cdot p_{E/E}\ . \tag{13}$$

Since the initial net assets are independent of intra-group finance, we define an effective tax rate for the period of ten year as

$$\tau_{eff}=1-\frac{\widetilde{GTV}_{\tau,10}-A_0}{\widetilde{GTV}_{10}-A_0}\ . \tag{14}$$

The effective tax rate reveals which part of the expected profit over a specific period time is taxed away. This measure covers effects of compound interest, so it is a function of time.

In Figure 9 we show the calculation of this effective tax rate for one period, assuming the parameters $\sigma=20\%, \lambda=75\%, \gamma=40\%, \tau_P=\tau_S=25\%$. The probability for an upward move is, according to (4), 55.15%. The return assigned to an upward move is 1.2214.

Figure 9: Determining effective tax rate

A_0	p_u p_d	$A_0\cdot u$ $A_0\cdot d$	$\widetilde{EBIT}_1$	$\tilde{I}_t$	$\widetilde{EBT}_t$	$\widetilde{LCF}_t$	$\widetilde{TB}_t$	$\widetilde{TA}_t$	$\tilde{A}_1$	$\widetilde{VLCF}_t$	$\widetilde{TV}_{S,1}$	$\widetilde{TV}_{P,1}$	$\widetilde{GTV}_{i,1}$	$E\left(\widetilde{GTV}_1\right)$	$E\left(\tilde{GP}_1\right)$	τ_{eff}
		122.14	22.14	-4.08	18.06	0.00	18.06	-4.51	113.54	0.00	113.54	3.06	116.61			
100	55.15% 44.85%													101.56	1.56	**61.74%**
		81.87	-18.13	-4.08	-22.21	22.21	0.00	0.00	77.79	2.21	80.00	3.06	83.06			

In spite of a 25% statutory tax rate, the effective tax rate amounts to 61.74%. This is a direct consequence of the asymmetric taxation of profits and losses.

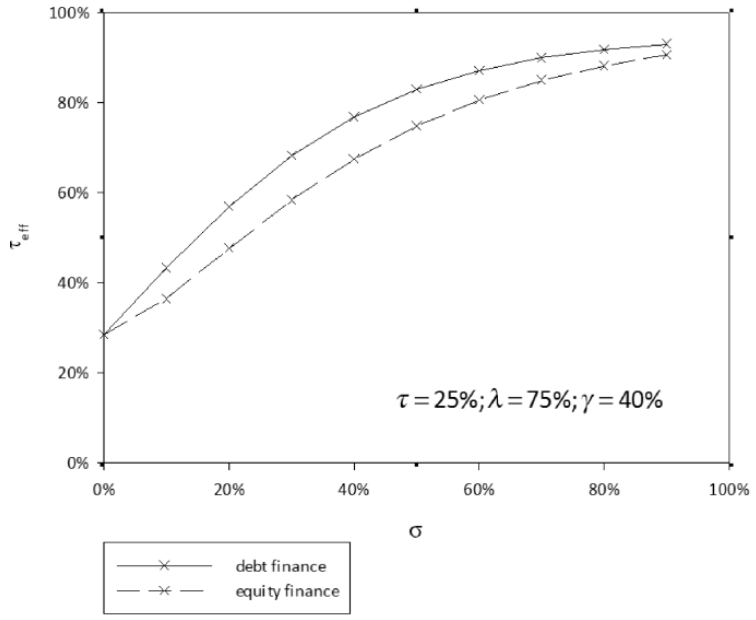
4 Results

Our analysis focuses first on a foreign subsidiary which is entirely equity- or entirely (classic) debt-financed (sections 4.1 and 4.2). The results will show that the use of hybrid finance is expected to help to reduce the effective tax burden. We will then test the advantageousness of cross border, intra-group hybrid finance with qualification conflicts (sections 4.3 and 4.4).

4.1 Does risk influence the tax burden?

In a first step we simulate the dependency of the effective tax rate on the risk of the subsidiary's activity. Figure 10 illustrates the effective tax rate as a function of risk for an entirely equity-financed company and for an entirely (classic) debt-financed company respectively. The effective tax rate clearly depends on the subsidiary's risky activity. It is based on identical statutory corporate tax rates (25%) in both countries.

Figure 10: Effective tax rate and risk



Under economic certainty ($\sigma = 0\%$) there are no differences concerning the effective tax rate. An effective tax rate of 28% occurs even though the statutory tax rate is 25%. This is due to the fact that the effective tax rate introduced in equation 13 is a function over time. Hence, the effective tax burden is increasing over time because compound interest influences the effective tax rate.

As soon as we include risk (volatility of results, $\sigma > 0$), (classic) debt-financing results in substantially worse results (higher effective tax rate at a risk above zero) in comparison to (classic) equity-financing. This may seem surprising, because it does not support the general assumption of debt finance being superior to equity finance from a tax perspective. As explained above, this results from the fact that interest payments are due also in case of loss, which does not immediately reduce tax payments but instead (only) increases a loss carryforward.

At a very high risk, the effective tax rate quickly approaches 100%. The central reason for this considerable increase in the effective tax rate lies in the fact that within the ten-year period (high) earnings are taxed whilst also (high) loss carryforwards may be generated which finally cannot be offset within ten years.

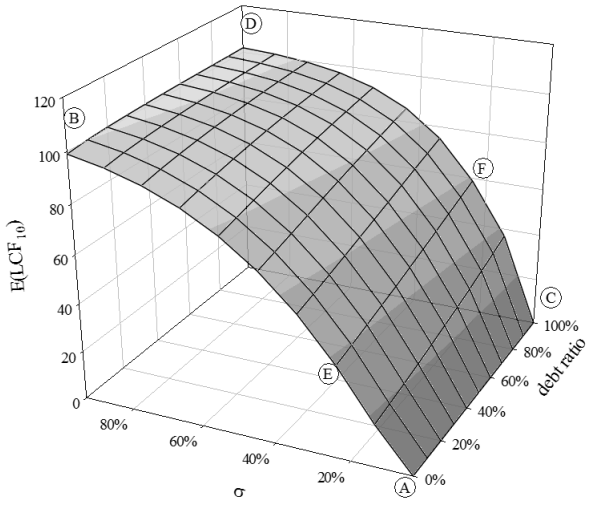
The upper graph in Figure 10 shows a stronger bend. With increasing risk, the difference between the effective tax rate in case of debt finance and in case of equity finance first increases, then decreases again. We can conclude from these results that the relevance of the intra-group finance decision is limited to medium-risky business. Both riskless as well as high risk-activities result in only little difference of the effective tax rates.

We would like to underline that we did not consider tax rate differences. The result would obviously differ, as debt financing becomes more attractive when the statutory rate in the subsidiary's state of residence is higher than in the parent's state of residence.

4.2 Why does risk influence the tax burden?

The reason for the substantial growth of the effective tax rate is due to the restricted loss offset during our ten-year analysis. In order to illustrate this effect, loss carryforward which has not been offset during this period is shown in the subsequent figure.

Figure 11: Risk and loss carryforward



In case of economic certainty no loss carryforward emerges during our ten-year analysis. This situation is illustrated alongside point A to C. Even though the subsidiary is entirely equity-financed (line AEB), with increasing risk also the expected loss carryover increases significantly at the end of the ten-year period.

However, in case the subsidiary is entirely debt-financed as in CFD, the increase in the expected loss carryforward in this situation is more substantial than the increase in the expected loss carryforward in case of equity finance. Apparently debt financing essentially influences the loss carryforward. However, at the end of the ten-year period in a very risky situation, e.g. alongside BD, the expected loss carryforward is almost insensitive to the method of financing. Especially in situations with an

average risk level, the finance method has significant impact. This situation is illustrated e.g. alongside point E to F.

As a result, and in compliance with the results from Figure 10, under economic certainty or high risk, the cross border, intra-group finance decision does not have an essential impact on the loss carryforward (and on the effective tax rate) in the last year of our analysis, though it is crucial in moderately risky situations.

4.3 Is hybrid finance advantageous?

The high rise in the effective tax rate under increasing risk, as shown in the previous section, asks for a solution in order to avoid constantly increasing loss carryforwards at the subsidiary due to interest expenditures, and a higher tax burden at the parent company due to interest income. A profit-related, variable compensation for debt-financing may lead to essential benefits for the corporation.

In the next step we will analyze if a hybrid instrument as outlined in 3.3 can lead to a reduction of the high effective tax burden related to risky business activities.

In order to deduce the effectiveness of a hybrid instrument we illustrate the composition of the expected terminal value in form of a distribution. The partial terminal values which can be assigned to the realizations of a corresponding number of upward moves are summarized in this distribution. In other words, Figure 12 shows the specific terminal values depending on the number of profitable years (upward moves) in the respective path in the ten-year period.

Due to the design of our research model, there are two paths offering no or ten upward moves respectively. As can be seen in Figure 12, the majority of all paths lead to the middle of the distribution. The distribution is skewed to the right in compliance with assumption (2). This is also true when assuming risk-neutral investors (4).

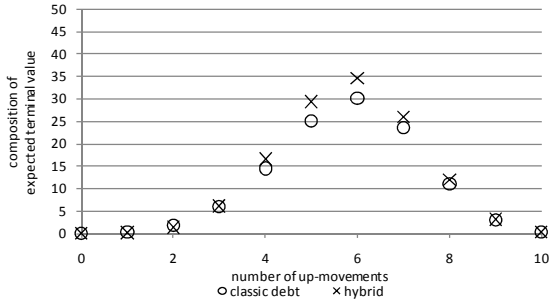
According to our previous considerations, the best case for the group is non-taxation of all cross-border yield payments. This is the case if the subsidiary's state of residence qualifies the yield as tax-deductable interest whilst the parent company's state of residence qualifies the yield as non-taxable dividend income. This scenario leads to the terminal-value distribution illustrated in the left-hand graph below.

The worst case for the group is a definite double taxation of the earnings. This is the case if the yield is qualified as dividend in the subsidiary's state and as interest in the parent's state of residence. Accordingly, the corresponding probability for the yield to be qualified as tax-exempt dividend income is zero. This situation is illustrated in the right-hand graph below. In addition to the graphical illustration of the distribution there are also two tables providing the exact composition of the specific terminal values.

Figure 12: Distribution of terminal values qualification conflict $\sigma = 30\%, \lambda = 75\%, \gamma = 40\%, \tau = 25\%$

$p_{de} = 100\%$

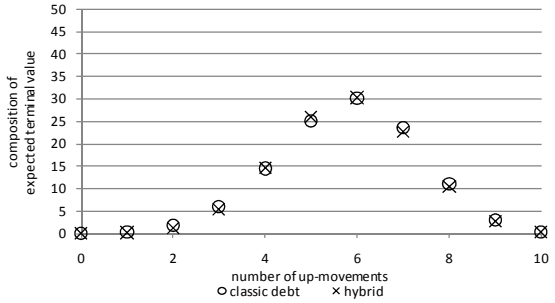
best case



n. of ups	classic debt	hybrid debt	ΔTV
10	0.34	0.36	0.02
9	2.93	3.13	0.20
8	11.07	11.96	0.89
7	23.49	25.91	2.42
6	30.20	34.58	4.38
5	25.11	29.41	4.29
4	14.52	16.56	2.04
3	6.06	6.14	0.07
2	1.81	1.40	-0.40
1	0.33	0.17	-0.16
0	0.03	0.01	-0.02
	115.90	129.62	13.73

$p_{de} = 0\%$

worst case



n. of ups	classic debt	hybrid debt	ΔTV
10	0.34	0.32	-0.02
9	2.93	2.77	-0.17
8	11.07	10.52	-0.55
7	23.49	22.73	-0.77
6	30.20	30.34	0.14
5	25.11	25.96	0.85
4	14.52	14.68	0.16
3	6.06	5.46	-0.60
2	1.81	1.26	-0.55
1	0.33	0.15	-0.18
0	0.03	0.01	-0.02
	115.90	114.20	-1.70

From the figure on the left it may be concluded that hybrid instruments may be advantageous, especially if "average" overall earnings are realized. According to the graphical illustration, one may deduce that there is no difference between hybrid and debt financing in both the case of 10 profit periods and 0 profit periods (10 loss periods). However, according to the tables below, the expected differences are rather small, and they do not contribute substantially to the terminal value. The reason for this is that the occurrence probability for each situation is very low. However, due to the fact that the majority of all possible 1024 paths lead to the middle of the distribution, their occurrence probability is relatively high. That is why these "middle" realizations contribute significantly to the difference resulting from hybrid or debt financing respectively.

From the analysis of the left figure it is obvious that in case of double non-taxation the hybrid finance leads to fundamental advantages compared to debt finance. Still, the exorbitant total tax burden cannot be completely avoided through the use of a hybrid instrument because also profit-related interest cannot prevent the taxation of profits abroad under uncertainty.

Surprisingly enough, hybrid finance is not advantageous in *all* realizations, even when considering double non-taxation of cross-border interest payments (left figure). If no, one or two upward moves occur during the ten-year period, then classic debt finance is advantageous in comparison to hybrid finance even though cross-border interest payments are untaxed in case of hybrid finance (negative difference in the left hand table). This can be explained by the fact that no, one or two upward moves are equivalent to ten, nine or eight downward moves (losses) during the ten years. In other

words, in most of those ten years losses occur. When e.g. two upward moves follow previous eight downward moves, classic debt financing allows a loss offset in the profitable periods. Variable, conditional hybrid finance yield payments are higher than fixed, unconditional interest payments. Hence, hybrid finance limits the chance to make use of a loss offset (less profit left). The disadvantage of reduced loss offset at the subsidiary's level in case of hybrid finance weighs more heavily than the disadvantage of corporate tax on interest income at the parent's level in the case of classic debt finance. In such a scenario, hybrid finance may prove to be disadvantageous in spite of a double non-taxation scenario.

Apart from the partial disadvantage of hybrid finance in the situation the subsidiary ends up with a huge loss after ten years, the analysis shows clearly that overall a quantitative relevant advantage is to be expected. When double-non taxation can be assured hybrid finance is clearly a useful instrument that helps to prevent the group from over-taxation of the risky business (129.62 vs. 115.90).

The left-hand figure above (best case) was designed under the assumption of a definite double non-taxation. In contrast, the right-hand figure was designed under the assumption of double taxation (worst case). One would expect hybrid finance in case of double taxation to be disadvantageous in comparison to classic debt finance.

Surprisingly, this is not necessarily the case. Hybrid finance is disadvantageous when the number of upward moves exceeds the number of downward moves (6 – 10 profit periods). If profit periods prevail, the yield according to a hybrid finance agreement is higher in comparison to classic debt finance. Since these higher yields are subject to double taxation and since classic debt finance ensures single taxation of interest payments, hybrid finance is disadvantageous.

When the number of profit periods decreases, hybrid finance proves to be advantageous (four or five up movements within ten years). In contrast to our expectations the expected group terminal value in case of doubly taxed hybrid finance exceeds the group terminal value in case of single-taxed classic debt financing. When analyzing these realizations, the explanation of this effect becomes obvious. In case of a loss, hybrid finance does not induce yield payments. Hence, in spite of the legal double taxation, due to a negative qualification conflict, no economic double taxation occurs. On the other hand, in case of classic debt finance, unconditional fixed interest increases a loss carryforward in the state of residence of the subsidiary and, at the same time, cross-border interest income is taxed at the parent's level. Accordingly, unconditional interest is subject to an economic double taxation while hybrid finance doesn't cause any taxation (in spite of legal double taxation).

When at maximum three upward moves occur within the ten years, hybrid finance proves to be disadvantageous again. In these situations, the effect that hybrid finance limits the chance to offset existing loss carryforwards in combination with taxation of the interest payments in the parent's

state of residence dominates. The advantage of hybrid finance, to usually not increase a loss carry-forward, does not play any important role when large overall losses occur.

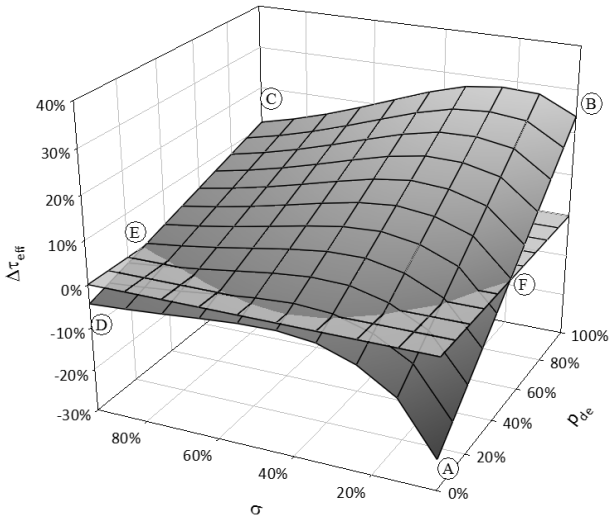
Considering the overall expected terminal value (114.20 vs. 115.90), hybrid finance is slightly (!) disadvantageous when doubly taxed. According to the findings illustrated in Figure 6, the hybrid finance was expected to clearly (!) underperform classic finance when doubly taxed. However, as far as the analyzed constellations are concerned, the advantage of the loss offset and the avoidance of economic double taxation almost compensates for the disadvantages of the double taxation.

Another substantial finding from Figure 12 is that the corporation's method of finance substantially influences the terminal value, whereas the distribution of the terminal value is just marginally influenced. From our point of view, this result supports the assumption of risk-neutral decision makers in our model.

4.4 Does qualification uncertainty affect advantageousness?

Up to now no general statements about the advantages of hybrid instruments in the context of economical uncertainty and the qualification risk can be deduced from the previous analysis, because only one specific volatility $\sigma = 30\%$ and two boundaries for p_{de} were under consideration. For more general results, the difference between the effective tax rate in case of hybrid finance and the effective tax rate in case of debt finance will now be simulated as a function of the subsidiary's risks and the probability of a double non-taxation. A positive $\Delta\tau$ indicates that hybrid finance is advantageous as compared to classic debt finance, while a negative $\Delta\tau$ indicates that hybrid finance is disadvantageous. The results are summarized in Figure 13. The horizontal square in Figure 13 marks the border between the positive area and negative area.

Figure 13: Effective tax rate as function of risk and p_{de}; $\lambda = 75\%, \gamma = 40\%, \tau_S = \tau_P = 25\%$



There is a linear interrelationship when the double non-taxation's occurrence probability is varied under economic certainty. This linear interrelationship is illustrated alongside AFB. If the occurrence probability for double non-taxation is 50%, the difference of the effective tax rate is, depending on the form of finance, approximately 0 (Point F). This is the result derived in the example shown above (Figure 6). (Due to the additional taxation of the parent company's assessed interest there are also marginal differences in the effective tax rate.) If the occurrence probability for double non-taxation increases further, the best result under economic certainty is achieved at point B. In this case it is also not possible to avoid taxation completely because the tax-free interest earnings from abroad result in higher domestic compound interest which is subject to tax in any case.

If double non-taxation is certain ($p_{de} = 100\%$), and if the risk increases (Line BC) a little up to approx. 30%, the advantageousness of hybrid finance increases even further. This is due to the fact that in addition to double non-taxation at an average risk the loss carryforward of the subsidiary can be reduced. As already stated above, at a very high risk (40% and above) the finance decision becomes irrelevant because the loss carryforward is generated and independent of any intergroup financing equally in both scenarios. Accordingly the advantageousness of the hybrid finance begins to decrease again (point C), but is still considerable.

In case double taxation is certain ($p_{de} = 0\%$, point A), hybrid finance is disadvantageous, and it does not become advantageous if the risk increases. However, to us it seems remarkable firstly that the disadvantage of the hybrid finance is limited to a relatively small area (restricted by the points A, D, E and F), and secondly that in spite of certain double taxation the comparative disadvantage is only approx. 5% although the statutory tax rate is 25%.

Hence we can conclude that also the risk of a qualification conflict in most cases does not lead to the disadvantageousness of the hybrid finance.

5 Conclusion

The use of cross-border hybrid finance is perceived to offer considerable tax advantages in an international context. In a profitable environment, double-dip constellations allow cases of double non-taxation of the yield: full deductibility at the debtor's level and tax-free repatriation lead to an untaxed form of finance, which is of particular interest for multinational groups. However, the use of hybrid finance in a cross-border setting is frequently connected with the risk of reassessment by fiscal authorities, eg. as a result of a tax audit. As a result the group may end up with double taxation in the worst case.

Sadly enough, economic reality does not offer a purely profitable environment. As soon as the possibility of risky business at the subsidiary's level is included and losses are to be expected eventually, the disadvantages of asymmetric taxation – immediate taxation of profits vs. tax relief for losses only with a time-lag, if at all – play a significant role and interfere with otherwise logical results.

By use of simulation, we analysed the advantageousness of cross border intra-group hybrid finance in a risky economic environment. In order to isolate the effect of qualification conflicts (differing qualification of the yield as interest-like or as dividend-like in the two countries), we did not include differing statutory tax rates in our analysis. The hybrid instrument offers variable yields, provided that profits are earned.

The results support previous research stating that debt finance of a foreign subsidiary, contrary to a general notion, is disadvantageous as compared to equity finance.

The disadvantage of debt finance can be overcome when doubly untaxed hybrid finance is employed. However, in cases where almost only losses occur or where almost only profits occur in a given number of years, the advantage of hybrid finance is negligible, against expectation.

In cases where legal double taxation of hybrid finance is certain or probable, hybrid finance is, as expected, disadvantageous. However, even here, under specific circumstances, hybrid finance can be even advantageous, due to the overweight of the disadvantages of asymmetric taxation in case of debt finance. Additionally, in case of a risky business, the disadvantage of hybrid finance is relatively small, and legal double taxation does by far not result in a double effective tax rate.

In cases where the qualification of hybrid finance as equity or debt in the domestic country as well as in the foreign country is uncertain (50%), the chances of double non-taxation and double taxation are equal, and hybrid finance still proves to be advantageous.

To conclude, tax planning measures employing hybrid finance normally offer the chance of untaxed income, and are connected to the "risk" of single, or worse, the risk of double taxation. Our results show that while the chance of double non-taxation is even higher when including economic uncertainty as a variable and reduces the effective tax rate considerably, the risk of double taxation is small and leads to only a little additional effective tax burden. In other words: with the use of intra group, cross-border hybrid finance, chances are good and risks are small, when qualification conflicts may arise.

6 List of symbols

$\widetilde{A}_t$	assets at time *t*
u	yield due to an upward move in the economy
d	yield due to downward move in the economy
$\widetilde{roa}$	continuously compounded expected return on assets
σ	volatility of the return on assets
p	probability measure
t	point of time
r_{cond}	conditional interest rate
r_f	riskless interest rate
π	participation hybrid finance in case of a positive return
$\widetilde{EBIT}_t$	earnings before interest and taxes
$\widetilde{I}_t$	interest payment in *t*
$\widetilde{EBT}_t$	earnings before taxes
$\widetilde{LO}_t$	loss-offset
λ	maximum loss-offset in percent
$\widetilde{LCF}_t$	loss carryforward
$\widetilde{TB}_t$	tax base
$\widetilde{TA}_t$	tax payment
τ_S	tax rate of subsidiary
τ_P	tax rate parent
τ_{eff}	effective tax rate
TV_P	terminal value parent
TV_S	terminal value subsidiary
$\widetilde{NP}_t$	net profit
$\widetilde{DA}_t$	distributable amount
$\widetilde{CLCF}_t$	commercial loss carry-over
$\widetilde{Div}_t$	dividend payment
δ	percentage of dividend distribution
$\widetilde{PLCF}_t$	commercial profit and loss carryforward
$\widetilde{FA}_t$	financial assets
p_{de}	probability for a payment being qualified as dividend in parent's residence state

p_{di}	probability for a payment being qualified as interest in parent's residence state
p_{de}	probability for a payment being qualified as dividend in parent's residence state
p_{di}	probability for a payment being qualified as interest in parent's residence state
γ	global tax shield assigned to loss carryforwards in t_{10}
i	number of a path
χ_i^A	cutting function for loss carryforwards due to low assets
χ_i^σ	cutting function for loss carryforwards due to low assets
$\widetilde{VLCF}_t$	valuated loss carryforward
$\widetilde{GTV}$	group terminal value

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