Abstract
M&A-transactions are often used by the top management for increasing their shareholder value for realizing identified synergy potentials of the target, like economies of scale and scopes. From a tax perspective they are interesting for the acquirer to reduce the group cash tax paid and the effective tax rate as well by using loss carry forwards of the target or utilizing the tax rate differences between the group entities. Simultaneously potential risk factors have to be captured early in the planning process to save the acquisition profit over all phases of an (m&a) transaction. In that context an important instrument is the so-called due diligence.

Actually empirical studies show that nearly 30 percent of all (m&a) transactions are not successful (Deloitte, 2012, p.27). Furthermore, the empirical results indicate that due diligence analyses could not be shaped efficiently as well. For improving and structuring the due diligence process, a holistic standard has not been established until now.

The main goal of this article is to develop a risk oriented, mathematically based approach for the tax due diligence, which helps to improve the issues for planning, assessing and monitoring the anticipated acquisition profit of a transaction under consideration of specific tax conditions related to the target.

The proposed model can systematically capture tax risks within the framework of tax due diligence. That makes standardization of the tax due diligence process possible, which in turn makes adoption into an (inter)national standard for conducting due diligence activities.

Keywords
Auditing, Mergers & Acquisitions, Corporate Governance, Corporate Taxation, efficient audit methods

1 Nature of the problem
After a period of stagnation during the financial and economic crisis, the market for corporate takeovers has recently stabilized again in Germany (Spanninger, 2011, p.50). For the management of the acquiring company there may be a certain pressure to show positive performance, to invest available liquidity as profitably as possible, and to assert itself in the market instead of becoming itself a target for acquisition. The increasing number of court cases dealing with corporate decision-making in case of loss situations further amplifies that effect (Graumann and Grundei, 2011, p.380). In that context an important instrument is the so-called due diligence (Beisel and Klumpp, 2009). It grants the acquirer access to sensitive information about the object to be acquired, for the purpose of being able to conduct a comprehensive audit. In that regard, due diligence has some important functions. Firstly, it serves to uncover risks of various natures and helps in the decision-making process in terms of shaping the agreement and finding a realistic price for the acquisition, because it allows for a better assessment of the target object. The slighting of asymmetries of information may be seen as a direct effect of due diligence. Moreover, due diligence can be said to have an absolving effect with regard to the due care that the management of a corporation must exercise when making decisions in the capacity of acquirers (OLG Oldenburg, 2006, p.66). That is particularly the case in respect of perusing the planning information and financial numbers of the target of the purchase.

Additionally, due diligence ensures that information starts flowing at an early stage between the target object and the acquirer, which is of significant importance for integration (Austmann, 2009, p.283). Both those functions have an indirect effect on acquisitions. To be in a position to make an assessment of the integration effort and to draw up a first plan for the purpose of effectively reaching the target, due diligence must lead to uncovering significant risks that are inherent in the object. They must be suitably documented and shall lead the acquirer to identify starting points for the future integration. From an economic point of view, those due diligence targets must, of course, be reached in a cost-effective manner (Wöhe and Döring, 2010, p.341).
Therefore, as far as due diligence is concerned, it must be analyzed which possibilities exist for enhancing efficiency.

Various functional subsections can be distinguished in due diligence (Berens and Strauch, 2010, pp.12), which may vary according to intensity and specifics of the transaction (sector, type of transaction, etc.). However, it can be fundamentally said that inspecting balance sheets and financing (financial due diligence), taxes (tax due diligence), the legal framework (legal due diligence), the corporate strategy and the market environment (strategy & market due diligence), staff (human resources due diligence) and the organization (organizational due diligence) is done regularly. Building upon that structure, further inspections may be conducted if required, such as doing an analysis of environmental risks (environmental due diligence) and of corporate culture (cultural due diligence) (Blöcher and Glaum, 2005; Berens and Strauch, 2002, p.62).

Tax due diligence has its own importance, for two reasons. Firstly, tax risks often present significant hindrances for transactions (Gerber and König, 2009, p.59). Uncovering tax risks must be of special interest to the management of the corporation. Secondly, contrary to other fields of due diligence, tax law is subject to frequent, dynamical changes (Hey, 2002, p.75) and puts rather complex demands on the inspection. It may not only have to deal with significantly different past, current and future tax regimes, but, in the case of international concern structures, it also has to take the tax requirements of other countries into account. Therefore, efficient inspecting and auditing is of paramount importance in the tax arena.

In order to determine whether there is potential for enhancing the quality of tax due diligence, the current status of research will first be examined hereafter (Chapter 2). Subsequently, the risk-oriented audit approach will be theoretically and methodically imposed on tax due diligence (Chapter 3). Core items of this contribution are the implications for tax due diligence that may become clear as well the uncovering of possible critical points. The contribution concludes with a summary of the results of the research (Chapter 4).

2 Current status of researching tax due diligence
2.1 Processes and quality of due diligence in general

Within the meaning of the deal economy, an M&A transaction is considered to be advantageous if the anticipated subjective idea of the acquirer in terms of the value of the target object over the entire M&A process exceeds the price that has been paid for the target object (Beyer and Castedello, 2010, p.37). From a tax perspective, the economic advantage of an M&A transaction depends on:

- the potential tax risks and opportunities of the targeted transaction that are identified during the transaction stage,
- the costs that are incurred on account of conducting the due diligence itself, as well as
- the tax savings that may be realized when consuming the target transaction, minus the requisite restructuring costs that are incurred during the integration stage. The latter are determined by the extent of pre-acquisition and post-acquisition measures (Gröger, 2010, pp.549 & pp.552).

All costs must be included in this consideration that are necessary for complete integration of the target company into the acquiring undertaking. That may perhaps need to include the costs for setting up a tax risk management system and / or the cost that may need to be incurred for adapting to the risks management system that already exists in the acquiring organization. To be able to sufficiently assess and plan, the tax subsystems of the target object must be analyzed as early as possible (Cui and Zhang, 2011, p.395). Thus, the success of an M&A transaction is to a decisive extent determined by the efficiency and quality of the due diligence inspection process and therefore demands a concept that is based on scientific points of view.

That requires firstly deciding on what ‘quality’ actually means. A due diligence inspection must be quite separate from the annual audit, because it is less profound (Hogh, 2010a, p.3). Nonetheless, the due diligence inspection is an economic audit that “typically” belongs to the scope of an auditor within the meaning of Articles 2, Paragraph 1, and 2, WPO (Wirtschaftsprüferordnung (Auditors Ordinance)). The scope of a due diligence differs from that of an annual audit. That being said, it is still possible to apply the term ‘audit quality’, because it must also cover the uniformly understood quality assurance of financial auditors in terms of all activities of the auditor – including due diligence inspections (Lück, 2000, p.1).

A generally accepted definition of quality does not exist in business administration (Niehus, 2002). Rather, the term should be defined on the basis of the underlying purpose (Bonner, 2008, p.3 & p.26). In principle, audit quality may be understood to be the entirety of all characteristics in terms of audit activity (Niehus, 2002; Cahan et al., 2011, p.860) that enables the auditor to uncover deviations from the standard and irregularities in the target of the audit (DeAngelo, 1981, p.186). Those characteristics (Fig. 1) may be subdivided into characteristics that come together within the person doing the auditing (notably experience, professional qualifications, etc.) and in characteristics that are enshrined in specific professional standards (especially audit standards that must be adhered to) (Orth, 2007, p.1101; Manita and Elommal, 2010, p.89).

There is a lot of literature about approaches to measuring audit quality (Bonner, 2008, p.30; Marten, 1999, p.148). To be able to measure something, dimensions must be allocated in advance to the measuring variables (Saint-Mont, 2011, p.23). The quality will depend on the dimensions that have been defined. Amongst others, they may be derived from theoretical knowledge of decision theory, adherence to professional standards or from the relationship between consumption of resources, such as time and / or costs (Bonner, 2008, p.30). Same as quality assurance,
a “peer review” in accordance with Article 57a, WPO, is often conducted in professional audit practice, in which the work of the auditor is verified by another, independent auditors (Marten et al., 2011, pp.541-571; Herkendell, 2007, pp.165-168). Accordingly, the approach is assessed as dimension against the professional standards for auditors, because in that respect they reflect compliance with professional and technical standards that are accepted as being of high quality.

However, currently no concept of professional standards exists for carrying out due diligence. As such, it remains to be seen to what extent high quality auditing can be assured without there being any standards. In fact, enhancement of quality could already be achieved by codifying professional standards (Niehus, 2002). On the one hand it would result in setting scales for assessing and measuring quality. On the other hand, it would open up the possibility of applying uniform quality assurance, for example within the framework of the quality control that must be carried out as per Article 57a, WPO. Therefore, the fitness of transferring the various dimensions to (tax) due diligence would have to follow suit.

2.2 Possibilities and limitations with regard to tax due diligence

With regard to tax due diligence there are problems in establishing one or more inspection standards because of the continuously increasing complexity and the frequency of changes that occur in (inter)national tax law (Hey, 2002, pp.69-76). Because of the globalization bringing more and more intertwining of international organizations (Börsig, 2008, pp.618-624), there are all the more points of contact between different jurisdictions. The missing and / or insufficient harmonization of tax law is the reason for the divergence of legal arrangements and consequently attaches a multi-dimensional aspect to the research into it. The multi-dimensionality emanates from the differences in legal arrangements in the countries where the object of the purchase is domiciled, bilateral and multilateral arrangements between countries (especially double taxation agreements respectively the Treaty of the Functioning of the European Union) (Lühn, 2009, p. 271) and national peculiarities and differences in legal treatment during past assessment periods. Consequently, from an audit-technical point of view, the inspection is rather complex (v. Wysocki, 1998, p.120).

The aforementioned facts trigger the question why, in the literature, there are no deliberations on reducing the complexity and / or planning of inspections. Instead, it is often recommended to uncover tax risks within the framework of tax due diligence with the aid of check-lists (Sinewe and Oelsner, 2010, p.22). Though apart from that there is sometimes a comprehensive presentation of different tax areas and possible sources of risk are shown as examples (Hogh, 2010b, pp.30-42). A critical remark in this connection is whether such an approach can be consistent with the objective of efficiency, whilst it is just as hard to categorically capture and prevent redundancies and obsolete audit practices as is avoiding not carrying out necessary audit tasks (so-called “under-auditing”) (Mochty, 1997, p.733). Though check-lists may be used within the framework of audits, it does not make the planning of an audit at meta-level possible. Additionally, check-lists harbor the danger that positions will be captured that, because of their universality respectively the particular acquisition situation, are of rather insignificant or subordinate importance for the buying organization (Berens et al., 2011, p.119). Whilst codification of standards may also be possible in other areas of due diligence, the problem of an inefficient inspection because of the high frequency of changes in tax law must be considered to be especially grave. Elaborating general standards in the field of tax due diligence therefore carries special importance.
With regard to tax due diligence, Löffler demanded as long ago as 2004 an independent framework concept in the form of an inspection standard (Löffler, 2004, pp.637). Hitherto, nothing like has been established, neither nationally nor internationally. As already put on the table, such a standard would have a decisively positive influence on the quality of a tax due diligence inspection (Niehus, 2002). Such standards should encompass a closed framework concept that should also make an economically efficient and, for reasons of the due care that is required in identifying tax risks, effective inspection planning of tax due diligence possible. Standards that exist for annual audits are based on the risk-oriented audit approach. As such, it should first be clarified whether the approach may also serve as starting point for setting standards for tax due diligence. Therefore, in the following it will be analyzed which findings of the annual audit can also be sensibly applied to tax due diligence.

3 Developing a risk-oriented inspection approach to tax due diligence

3.1 Suitability of the risk-oriented audit approach for due diligence

Tax due diligence is an economic inspection that incorporates giving advice on tax elements and falls within the scope of an auditor. There are numerous activities during an annual audit that must also be carried out during a due diligence inspection, which require coordination for reasons of efficiency (Pollanz, 1997, p.1354), even though the scope of an annual audit is usually much wider than the scope of a due diligence inspection (Hogh, 2010a, p.3). Because the inspection within the framework of tax due diligence is carried out by order of a private party and not because it is legally required, there are important differences to an annual audit, which must be adequately taken into consideration.

Although hitherto no uniform and comprehensive inspection theory has been established, various theoretical approaches to providing a basis for the inspection exist (Ewert, 2007, pp.1119). With regard to planning the inspection, the so-called audit risk model has gained prevalence, both nationally (IDW, 2012) and internationally (AICPA, 1984). It defines the audit risk (AR) as the probability that an auditor will accept an audit area as correct, in spite of materially false statements being made. The audit risk is the multiplicative linking of inherent risk (IR), control risk (CR) and detection risk (DR). The inherent risk describes the probability of occurrence of significant errors in the annual accounts, the control risk describes the probability of internal audit of the organization failing to detect such errors and the detection risk describes the probability of the auditor failing to detect significant false statements in the annual accounts (AICPA, 1984). Theoretically, the audit risk model can be presented as follows (Marten et al., 2011, p.208):

\[ AR = IR \cdot CR \cdot DR \]  

Although in part there have been further developments in this field of science (Baetge et al., 2011, pp.129-136), the model has remained virtually unchanged in its recognition since its inception. New findings make the case for stronger linking between the inherent and control risks (IAASB, 2009).

But independence of the two components continues to be possible (Ruhnke, 2007, p.157). In practice, the model is not used for assessing the probabilities item by item. Rather, the probabilities are captured as bandwidths (Wolz, 2003, pp.296-348). In its practical application, the model contributes to determine the extent of audit procedures necessary to assess the orderliness of the annual accounts (Stibi, 1995, pp.123-135).

For that, the basic equation (Eq. 1) must be adapted for the detection risk, because it is the only variable that can be influenced by the auditor (Marten et al., 2011, p. 210). The result is:

\[ DR = \frac{AR}{IR \cdot CR} \]  

Although the maximum acceptable audit risk (AR) is given, the inherent (IR) and control (CR) risks must be estimated by the auditor on the basis of the results of the preliminary audit. The required scope of random checks is derived from detection risk that has been determined in that way (Stibi, 1995, pp.133).

The core idea of the risk audit model is the concept of the sufficiency of certainty that must be applied to the annual audit (Orth and Eisenhardt, 2009). Neglecting insignificant errors within the framework of an annual audit is justified from an economic point of view, because a complete inspection cannot be brought in harmony with the principle of efficiency (Marten et al., 2011, p.207). By focusing on risk-bearing audit targets, an effective and efficient audit is guaranteed.

Due diligence must also follow those points of view. Especially the aspect of efficiency must be brought to prominence, because it is one of the obligations of due care of an orderly and conscientious businessman (Krieger and Sailer-Cocceni, 2010). Analogous to an audit of annual accounts, tax due diligence is also a complex inspection, because numerous entrepreneurial interdependencies of the target object form the subject of the inspection in a dynamic (legal) environment. Accordingly, a complete audit should be avoided under the principle of efficiency. Rather, the management of the acquiring organization should be directed towards focusing on the essential risks (OLG Oldenburg, 2006, p.66). Taking the significant overlapping of requirements and deployment possibilities of both tasks into account, in principle, the risk-oriented audit approach can also be applied to the tax due diligence inspection. Albeit that the remaining differences require modification.

3.2 Modification of the risk-oriented audit approach

If audit risk (AR) is first looked at, it should logically be transformed into the maximal residual tax risk that can be tolerated by the principal. In respect of the framework conditions of
the deal economy that have already been described, the term ‘tax risk’ can be defined as unplanned additional payments that must be made by the acquirer, which, therefore, he must include in his calculations. Such additional payments may become necessary in relation to the purchased object itself, within the framework of a so-called “share deal”, as well as when taking over packages of tangible assets within the framework of a so-called “asset deal” (such as on the basis of tax liability regulations like Articles 73 and 75, general tax code (AO), or also Article 25, Commercial Code) (Haun and Stelzer, 2009, p.514).

As financial means dissipate, the advantageousness of buying the enterprise may well take a turn for the worse for the acquirer. Therefore, there is a relationship between the tolerable additional payments of the acquirer and the maximum price that he may be willing to pay for the object to be purchased (expected value (EV)) and the actually agreed target price (TP). The difference between both components (acquisition profit (AP)) sets the basis for determining the maximum risk that can be tolerated by the acquirer (tax due diligence risk (TDDR)), measured as a percentage of the purchase price:

\[ AP = EV - TP \quad \text{with} \quad AP \in \mathbb{N} \]  

as well as

\[ TDDR = \frac{EV - TP}{TP} \quad \text{with} \quad TDDR \in \mathbb{R}^* \]

If the total of the difference between the actually paid purchase price and the maximum amount of the acquirer for additional tax payments is used up, it could be that there will be no financial advantageousness. In an extreme situation, the potential “acquisition profit” may be fully consumed by the existing tax risks. In a further step, the principal must therefore determine which share of economic advantageousness (AP) he may be willing to forgo as a possibly liable debtor within the meaning of Article 191, Paragraph 1, juncto Articles 73, 74 and 75, AO, as well as other tax liability standards under individual items of tax legislation and / or liability standards under commercial law and in the form of costs for due diligence inspections. In this respect this part reflects the percentage share of the tax risks that have not been discovered within the framework of the due diligence inspection. Accordingly, the economic advantageousness is broken down into:

(1 φ) reflects the percentage share of the discovered tax risks that may possibly be recognized in the form of a corresponding reduction in the purchase price. To this extent the full risk compensation through the reduction in the purchase price and the expected economic advantageousness remains, under ideal circumstances, constant in the result. But in reality it must still be noted that it is exactly the enforceability of risk compensation that is to a significant extent determined by the competitive situation in the tender procedure. That situation might be captured by adding a further probability factor.

Thus, the expected tax due diligence risk \( E(TDDR) \) is determined as follows, whilst taking the risk appetite of the principal into account:

\[ E(TDDR) = \frac{(EV - TP) \cdot \phi}{TP} \quad \text{with} \quad \phi \in \mathbb{R}^*[0 < \phi \leq 1] \]  

The inspection risk is made up of the components inherent risk, control risk and detection risk. When transferring to the field of tax due diligence, inherent risk (IR) is equal to case-specific tax risk (scope-related risk (SRR)) that is attached to the organization because of, amongst others, its legal form, its economic engagement, and the legal framework of the sector. This reflects the fundamental tax risks that reside in the object of the purchase. Furthermore, control risk consists of the combined control risk of the types of taxes under consideration (combined control risk (CCR)), which is based on the systems in relation to the single type of tax that exist within the company. Finally, detection risk (DR) is fully transferable, without limitation, to the tax due diligence inspection and merely differs from the audit risk model of the annual audit as far as the object of the inspection is concerned. The resulting equation for the risk-oriented tax due diligence inspection model is:

\[ TDDR = SRR \cdot CCR \cdot DR \]

The TDDR component is specified by the acquirer through \( E(TDDR) \). Equating the formulas (5) and (6) results in:

\[ \frac{(EV - TP) \cdot \phi}{TP} = SRR \cdot CCR \cdot DR \]  

Fundamentally, the limit price of the acquirer cannot be set precisely, but only in the form of a bandwidth (Matschke and Brösel, 2006, p.113). It depends on the alternative investment opportunities of the acquirer (Sieben and Schildbach, 1994, pp. 24-28), the possible synergy effects and economies of scale (Meckl and Riedel, 2011, p.378) and on the existing environment (especially market conditions) and is, at least in theory, a fixed value. Against that, the price that is actually paid depends on the limit price of the acquirer as well as of the vendor.
(resultant agreement range) and the negotiation position and flair of both parties (Münch, 2010, p.219). In order to optimize those values, against the background of the retroactive impact of detected tax risks on the purchase price, those values should initially be laid down as provisional estimated values, for example through planning calculations and multiples (Coenenberg and Schultze, 2002, pp.699). That will then give consideration to the fact that the tax due diligence risk symbolizes the actual situation after due diligence has been carried out, notwithstanding that it must be laid down in advance.

3.3 Optimizing due diligence from the point of view of the acquirer

The case-specific tax risk must be estimated by the auditor within the framework of the preliminary inspection, as must the combined control risk. Also the inspection program must be derived from that inspection. Accordingly, the detection risk is once again the only variable that can be influenced by the auditor, so that formula (6) will be determined as per the detection risk of the scope of the inspection activities in relation to the statement:

\[ DR = \frac{E(TDDR)}{SRR \cdot CCR} \]  

Applying the equation (5) results in:

\[ DR = \frac{(EV - TP) \cdot \varphi}{TP \cdot SRR \cdot CCR} \]

\[ \Rightarrow DR = \frac{(EV - TP) \cdot \varphi}{TP \cdot SRR \cdot CCR} \]

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It must be taken into consideration that a minimum scope of inspection actions or, respectively, a maximum detection risk exists on account of the existing information asymmetry between vendor and acquirer in relation to the existing tax risk and the concomitant uncertainty as well the retroactive impact of detected tax risk on the purchase price that is to be paid from the point of view of the acquirer, which may not be exceeded. For every other detection risk that is mitigated, more inspection actions will be required and the costs of tax due diligence will be higher, which in turn will have direct influence on the advantageousness of the transaction. Assuming that the tax due diligence inspection is done by a third party, which is quite common in practice (Sinewe and Oelsner, 2010, p.19), the cost function \( K(x) \) may, in principle, be taken linearly (Coenenberg et al., 2013, p.68). It consists of a component of fixed costs that the acquirer must be for initiate the tax due diligence without carrying out specific inspection activities (for example, for drawing up the agreement, accepting the order, administrative expenses, etc.) and of a variable component that depends on the scope of the inspection activities that must be carried out in terms of hours \( x \) at the hourly rate \( k \). The result is:

\[ K(x) = F + k \cdot x \]  

(10)

Albeit the cost function being linear, such a conjunction does not exist between the detected risks and the inspection actions that have been carried out respectively the hours that have been worked. Initially, it must be assumed that the number of existing (potential) tax risks in the object that is to be bought is limited. Otherwise there could be additional tax payments at unlimited levels. Therefore, from the point of view of the acquirer, reducing the detection risk is only advantageous, if the costs of the additional inspection activities are more than compensated by the tax risks detected and by the appurtenant price reduction.

In analogy to the audit risk model, a non-linear conjunction between the quantity of tax risks and the additional tax payments in connection with the relevant risk and reducing risk detection, when carrying out additional inspection activities, must be assumed. That permits the optimal degree of detection risk to be determined. Specifically, the following conjunctions apply to this assumption:

- The first inspection activities lead to the fast detection of tax risks.
- The more inspection activities are carried out, the less financial impact will detected tax risk have.
- If eventually all existing risks have been detected, meaningfully increasing the inspection activities is no longer possible.
- Risks that are detected first will have a higher potential for damage and therefore lead to a greater reduction in price than subsequently detected risks. That is a result of the risk-orientation of planning the inspection, which first leads to the detection of the potential additional tax payments that have a high probability of them actually occurring.

Therefore it yields a production function in which the number of hours of the inspection is explained by various influence variables that reflect the case-specific tax risk and the combined control risk. Similarly to producing audits of annual accounts (Koch and Wüstemann, 2012, pp.509-511; Hackenbrack and Knechel, 1997, p.485; Banker et al., 2003, pp.258-260), the output of worked hours \( x \) can be determined through the following formula:

\[ \ln(x) = \beta_0 + \sum_{k=1}^{K} \beta_k \cdot \ln(y) + \varepsilon \]  

(11)

In relation to the audit of the annual accounts, the possible influential factors \( y \) are, for example, the sector, the size and the existing intertwining of the organization (number of affiliates respectively parent companies), the possession ratios, the scope and effectiveness of existing internal control systems
and perhaps advance knowledge of the particular auditor. But other than in the case of auditing the annual accounts, for a tax due diligence exercise the principal determines the scope of the inspection. As instrument for providing information, this scope must fundamentally be determined from a cost-benefit point of view, even under the aspect of management responsibility in capital corporations (BGH, 2011, p.752). On one hand, the benefit of the acquirer (utility, \( U(x) \)) depends on the tax risks (Tax Risks, \( \delta_{TR} \)) that already exist in the object to be bought. Firstly, the acquirer can mitigate existing uncertainties and asymmetries in information through due diligence and make a purchase decision on a sure basis. Secondly, the awareness of existing tax risks can be used to reduce the purchase price during possible later negotiations.

On the other hand, those positive aspects must be juxtaposed to the costs of the tax due diligence inspection. Although the due diligence inspection must be conducted under legal liability points of view, the principal can nonetheless determine the scope himself. Accordingly, the optimum must depend on the personal risk appetite of the principal. The benefits will follow from the costs (negative contribution to benefits), the possible negotiation cards emanating from detection of risks (positive contribution to benefits) as well as knowledge of the detected risks themselves, because they influence the decision of the acquirer in the light of his risk appetite. In analogy to determining the scope of the inspection, the utility function also takes account of the number of hours worked by the auditor. Because this is a decision with uncertainties, a Bernoulli utility function may be used (Laux et al., 2012, p.109). Forced by legal liability when conducting a tax due diligence inspection, a minimum scope would have to be ensured (OLG Oldenburg, 2006, p.66). That minimum inspection scope is represented hereafter by the costs of global and detailed planning of the detection risk that must be contained under legal liability aspects. The costs have altogether a fixed character. On the assumption that there will be no variable costs in this case, because no inspection activities need to be carried out, the benefits should in this case match the costs and therefore be zero. It leads to the following general form of the risk utility function:

\[
U(x) = \ln \left( 1 + F + \delta_{TR} \cdot \left( 1 - e^{-\alpha \cdot x} \right) - K(x) \right)
\]

(12)

In utility functions as per Eq. (11), the aspects that have been touched upon earlier, will be adequately taken into consideration. It contains first the existing tax risks (\( \delta_{TR} \)). Furthermore, the e-function presupposes that with an increasing number of invested hours, the monetary value of detected tax risks will reduce. If it is assumed that only a finite number of tax risks exists in the organization and the risk-oriented audit approach is applied, the risks with high monetary values would be detected first, but further inspection activities would have a falling limit value. By applying the logarithmical function, a preference of the decision-maker for mitigating risks is taken into consideration. The individual degree of risk aversion is captured in variable \( \alpha \) here. Though, in principle, the risk utility function presupposes the decision-maker to be risk-averse, it is actually just right for capital corporations (Nell and Richter, 1996, pp.240-242). However, the degree of risk aversion may vary individually. The more pronounced the risk aversion is, the more closely does \( \alpha \) approach the value zero. Applying formulas (11) and (12) and assuming that \( \varepsilon = 0 \) will yield:

\[
U(x) = \ln \left( 1 + F + \delta_{TR} \cdot \left( 1 - e^{-\alpha \cdot x} \right) - K(x) \right) - (F + k \cdot e^{-\beta \cdot K(x)})
\]

(13)

Equation (13) demonstrates that fixed costs are not so important any more, to the extent that they arise anyway for the purpose of avoiding liability. In case that there really exist no tax risks in the object to be purchased, there will not be any inspection activities either, because that determination can already be assessed by the auditor within the framework of accepting the order. An example from real life might be a share deal that has been subjected to external auditing on every reporting date during all relevant past assessment periods with relevance to legal liability and for which the initial tax assessments have not changed, respectively the amendment decision in accordance with Article 164, Paragraph 3, Sub 3, AO, juncto Article 120, Paragraph 1, AO, does not contain further secondary stipulations. In this case, a change in the tax assessment would only be possible in the case of tax evasion or careless underpayment of tax (blocking of changes as per Article 173, Paragraph 2, Sub 1, AO). In this case, the benefits from the tax due diligence inspection are:

\[
U(x) = \ln \left( 1 + F + \delta_{TR} \cdot \left( 1 - e^{-\alpha \cdot x} \right) - K(x) \right) - (F + k \cdot e^{-\beta \cdot K(x)})
\]

(14)

If, on the other hand, tax risks do exist, it may make sense to expand the inspection activities if the detected tax risks exceed the costs. Observation of the limit value of Eq. (13) yields:

\[
limit_{x \to \infty} \ln \left( 1 + \delta_{TR} \cdot \left( 1 - e^{-\alpha \cdot x} \right) - k \cdot x \right) = \ln \left( 1 + \delta_{TR} - \infty \right)
\]

(15)

Although the function for a negative value range has not been defined, it can be seen that the optimal permissible degree of detection from the point of view of the acquirer depends on the one hand on the cost function of the provider of the tax due diligence service and on the other hand on two own utility function in relation to the tax due diligence inspection.
The function can take various courses here, the course of the tax risks that exist in the object to be purchased, the course of the variable costs and the course of the efficiency of carrying out the inspection exercise. Whilst the course of the cost function is linear, the course of the utility function depends on the existing tax risks and the permissible number of hours.

Figure 2 shows two possible courses. Both utility functions initially show strongly rising benefits that arise as a result of the first inspection activities. After that, the rate of increase flattens and falls as soon as the costs of additional inspection activities are lower than the additionally detected tax risks. The risk utility function $U_1(x)$ reflects a more risk-amenable decision-maker vis-à-vis risk utility function $U_2(x)$. Whilst decision-maker $U_1(x)$ reaches its maximum benefits already after only few hours of work on inspection activities, the benefits of decision-maker $U_2(x)$ continue to rise steadily. Therefore, $U_2(x)$ would prefer a greater inspection scope and a lower tax due diligence risk than $U_1(x)$.

![Fig. 3 Possible course of costs and utility functions.](image)

An optimum may be determined on the basis of the first derivation:

$$
\frac{dy}{dx} = (1 + \delta_{TR} \cdot \left(1 - e^{(-\alpha x)}\right) - k \cdot x)^{-1} + \alpha \cdot \delta_{TR} \cdot e^{(-\alpha x)} - k \cdot x \geq 0 \tag{16}
$$

Because of the negative exponents of the internal derivation for the logarithmical function, the equation can only be solved approximately, for example through applying the so-called Newton method (Schaback and Wendland, 2005, pp.107-119; Huckle and Schneider, 2006, pp.239-248). The empirical estimation of Eq. (12) can therefore be taken as the initial starting point for deriving the inspection program. The exact scope is determined by the risk preferences of the principal.

### 3.4 Implications and limitations of the model approach

The proposed model can systematically capture tax risks within the framework of tax due diligence. That makes standardization of the tax due diligence process possible, which in turn makes adoption into a(n) (inter)national standard for conducting due diligence activities possible. By falling back on the risk-oriented audit approach that is recognized in practice, its use will be facilitated. From the point of view of the due diligence service provider, some training costs can perhaps be avoided, because the existing model is already known to the staff (Ruhnke, 2007, p.156). It does, however, provide a first approach for closing the identified gap in research on theoretical foundations that are close to actual practice.

But it remains to be seen to which extent the existing criticisms of the risk-oriented audit approach will also be applicable to the risk-oriented tax due diligence inspection model. The first criticism is the deficient independence of the individual components (Marten et al., 2011, p.212), which is, however, no mandatory precondition for applying the inspection model (Stibi, 1995, pp.143-146).

A further criticism is the subjectivity and deficient accuracy of the estimations of the risk components (Wiedmann, 2006, p.1946). But against that, it can be said that disclosing subjective probabilities will expose contradictions and effects of scale by making use of existing expertise, which would be particularly applicable to tax due diligence.

Further criticisms, such as deficient completeness because of overestimating existing risks (so-called $\alpha$ risks in auditing annual accounts), the deficient certainty because of simplification and the missing weighting of the risk components (Marten et al., 2011, p.214) cannot be fully applied to the model. For example, weighting according to types of tax or possible causes of liability might be possible in the tax arena. Moreover, those criticisms have, in practice, not led to rejection of the risk-oriented audit approach (Baetge et al., 2011, p.127). In respect of the deficient completeness it could additionally be said that the minimum inspection scope for tax due diligence is already specified by the economic framework conditions, as has been demonstrated.

In respect of tax due diligence, the deficient need for such an inspection could indeed be established by contractually excluding tax risks, for example in the form of tax clauses. But such agreements (Trimborn, 2010, pp.443) do not bring about a shifting of the material tax debt, but rather do embody a claim, purely under civil law (Mammen and Sassen, 2011, p.832). Accordingly, fulfillments of those claims depend to a decisive extent on the creditworthiness and dependability of the acquirer (Dobler and Lambert, 2011, p.122). On top of that, enforceability in other countries is doubtful (Dix and Zwiener, 2010, p.473). Proceedings before the courts are, in any case, less certain than taking the risks into account that have been determined in advance within the framework of the purchase agreement. Therefore, tax due diligence is an indispensable instrument for the acquirer in respect of securing risks and sets the first step on the road to successful integration.
of the object of the purchase into the acquiring organization or related companies and thereby to a sustainable increase in shareholder value (Meckl and Riedel, 2011, p.380).

4 Conclusions and further research needed

In the contribution at hand it was possible to demonstrate that transferring the risk-oriented audit approach to tax due diligence is possible and makes sense. Moreover, this model provides a first approach for closing the gap in research with regard to standardization of the tax due diligence process. For that purpose, the risk components must be modified and the findings from the deal economy must be integrated, so that efficient use of this model can be ensured. Existing criticisms hardly limit the advantages of using it. There are further areas of beyond applying the model in tax due diligence. For example, such a concept could be used in formulating renovation concepts, so that they can be systematically prepared for tax optimizing. This would enhance the quality of tax due diligence. Based on the given risk appetite (risk level) by the principal, the model provides a basis for exculation within the framework of legal disputes for those charged with carrying out the due diligence. The model also provides the person charged with carrying out the inspection with a structured concept for doing so.

At first sight, there would be a need for future research into system auditing and the combined control risk. In order to enable the integration of the tax process into the entrepreneurial subsystem, the structure and design of those systems must be sufficiently well known. And then, systems for identifying tax risks hardly exist. Therefore, further research will be needed into the shaping of the inspection activities that must be carried out, so that the whole matter can become more efficient. Especially, attention should be paid to the development and efficient deployment of analytical inspection activities in the tax arena, with the aim of optimizing the substance of the scope of the inspections as well as its costs. Finally, testing in practice and therefore verification of the empirical results is still required. The model at hand offers first starting points and can serve as basis for such deliberations.

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References


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