

Schäfer, Klaus; Pohn-Weidinger, Johannes

Working Paper

Exposures and exposure hedging in exchange rate risk management

Freiberger Arbeitspapiere, No. 2005/19

Provided in Cooperation with:

TU Bergakademie Freiberg, Faculty of Economics and Business Administration

Suggested Citation: Schäfer, Klaus; Pohn-Weidinger, Johannes (2005) : Exposures and exposure hedging in exchange rate risk management, Freiberger Arbeitspapiere, No. 2005/19, Technische Universität Bergakademie Freiberg, Fakultät für Wirtschaftswissenschaften, Freiberg

This Version is available at:

<https://hdl.handle.net/10419/27093>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

TECHNICAL UNIVERSITY BERGAKADEMIE FREIBERG
TECHNISCHE UNIVERSITÄT BERGAKADEMIE FREIBERG

FACULTY OF ECONOMICS AND BUSINESS ADMINISTRATION
FAKULTÄT FÜR WIRTSCHAFTSWISSENSCHAFTEN



Klaus Schäfer
Johannes Pohn-Weidinger

Exposures and Exposure Hedging in Exchange Rate Risk Management

FREIBERG WORKING PAPERS
FREIBERGER ARBEITSPAPIERE

19
2005

The Faculty of Economics and Business Administration is an institution for teaching and research at the Technische Universität Bergakademie Freiberg (Saxony). For more detailed information about research and educational activities see our homepage in the World Wide Web (WWW): <http://www.wiwi.tu-freiberg.de/index.html>.

Addresses for correspondence:

PD Dr. Klaus Schäfer
Technische Universität Bergakademie Freiberg
Fakultät für Wirtschaftswissenschaften
Professur für Allgemeine Betriebswirtschaftslehre, insbesondere
Investition und Finanzierung sowie Rohstoff- und Energiewirtschaft (Vertretung)
Lessingstraße 45, D-09596 Freiberg (Germany)
Phone: ++49 / 3731 / 39 36 06
Fax: ++49 / 3731 / 39 40 53
E-mail: klaus.schaefer@bwl.tu-freiberg.de

Mag. (FH) Johannes Pohn-Weidinger
Am Weissenfeld 258
A-5431 Kuchl (Austria)
Phone: ++43 / 6244 / 7124
Fax: ++43 / 6244 / 7124
E-mail: johannes.pohn@web.de

ISSN 0949-9970

The Freiberg Working Paper is a copyrighted publication. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, translating, or otherwise without prior permission of the publishers.

Coordinator: Prof. Dr. Michael Fritsch

All rights reserved.

Contents

Zusammenfassung / Abstract	II
1 Currency and exchange rate risk	1
2 Exposures to the exchange rate risk factor.....	3
2.1 Translation exposure	3
2.2 Economic exposure	5
2.3 Transaction exposure.....	6
3 Hedging transaction risk using forwards.....	8
3.1 Basic hedging positions.....	8
3.2 Hedging from a utility viewpoint	9
4 Objectives of exchange rate risk management.....	11
Bibliography.....	14

Zusammenfassung

„Exposures und Absicherung im Währungsrisikomanagement“

Steigende Volatilitäten an den Devisenmärkten haben beträchtliche Auswirkungen auf Unternehmen. Zum Teil auch als Reaktion auf diese Entwicklung hat sich das Angebot an derivativen Finanzinstrumenten, mit denen sich Unternehmen gegen die Auswirkungen schwankender Wechselkurse absichern können, deutlich erhöht. Ein vollständiges Verständnis der mit schwankenden Wechselkursen einhergehenden Risiken und ein korrekter Einsatz derivativer Instrumente erfordern eine fundamentale Betrachtung der Parameter eines Währungsrisikomanagements. Im ersten Teil des vorliegenden Papiers werden deshalb die Begriffe des Wechselkursrisikos, des Währungsrisikos und der verschiedenen Währungs-Exposures systematisiert. Im zweiten Teil wird ein entscheidungstheoretisches Kalkül zur Bestimmung der optimalen Absicherungsposition mit Währungs-Forwards bei Vorliegen eines Transaktionsrisikos vorgestellt.

JEL-Klassifikation: F31, G15, G39

Stichworte: Währungsrisiko, Transaktionsrisiko, Währungs-Forwards, optimales Hedging.

Abstract

Corporations are affected by increasing volatilities on foreign exchange markets. A response to this development was the creation of financial instruments, so called derivatives, in order to protect corporations from the effects of flexible exchange rates. To understand the included risks and to take correct decisions it is necessary to get a fundamental insight into exchange rate risk management. First it is the aim of this paper to systemize the possibilities of determining exchange rate risk as well as objectives of exchange rate risk management. In the second part of the paper a model to determine the optimal hedge ratio in the case of hedging transaction risks with forwards is described.

JEL-classification: F31, G15, G39

Keywords: Currency Risk, Transaction Risk, Currency Forwards, Optimal Hedging.

1 Currency and exchange rate risk

Currency risks for corporations arise from all those activities of a corporation that are carried out outside the firm's currency area. Currency risks are a result of exchange rate fluctuations as well as the unforeseeable extent of exchange rate changes. The inability to predict exchange rate changes as well as the extent of these changes creates uncertainties for corporations in regard to potential losses. In line with these findings currency risk can be defined as the uncertainty regarding future movements of exchange rates. Additionally, currency risks arise from unexpected interventions of currency regulators. Depending on what causes them, the generic term currency risk can be subdivided into exchange rate risk, the risk of parity changes, and convertibility/transfer risk.

The exchange rate is the price of one currency measured in terms of another currency. Direct quotation displays the number of domestic currency per unit of foreign currency. Indirect quotation displays the number of foreign currency units per unit of domestic currency. Exchange rate risk seems to be an important source of potential losses for corporations in regard to currency risks (fig. 1). The effect of the presence of exchange rate risk is that financial positions denominated in foreign currency are exposed to possible changes in value. This risk becomes manifest in, e.g., an unfavourable change in value of receivables that is not offset by a change in value of payables.

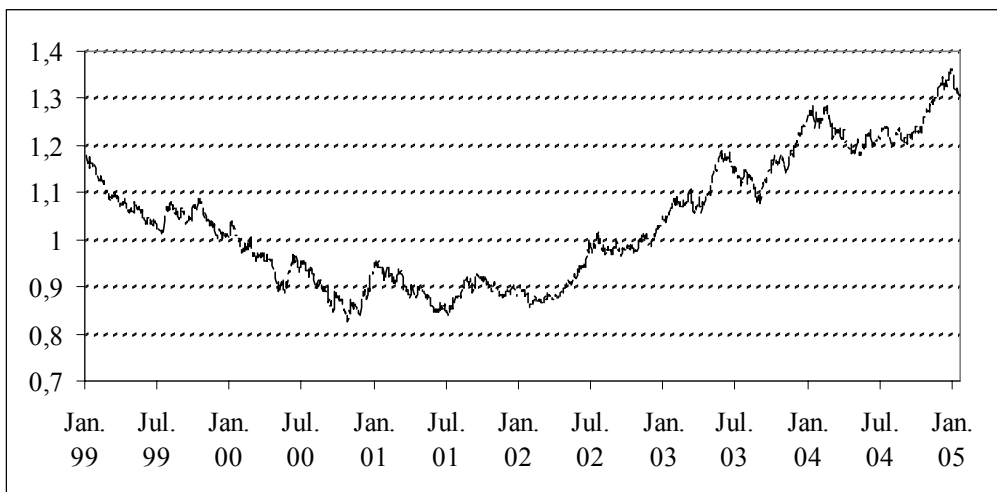


Fig. 1: EUR/US\$-Daily quotations 1999-2005, European Central Bank

The term exchange rate risk is defined in many different ways (Pfennig 1998, p. 11; Breuer 2000, p. 117). Exchange rate risk can be defined as the probability distribution of future uncertain exchange rates that affect the value calculated in home currency of certain financial positions. This definition emphasises the fact that future exchange rates typically are not known for certain in advance. In addition, it states that the knowledge of corporations as to future exchange rates is limited to a probability distribution of future exchange rate changes. A requirement for exchange rate risk and currency risk in general to arise is the existence of a financial position that is affected by possible exchange rate changes. Such a financial position is called currency exposure or, for short, exposure. An exposure represents a target for exchange rate risk. It is a result of real business and the financial activities of a corporation. Based on these statements, two parameters can be identified that affect the financial positions of a corporation:

- Price risk results from unexpected changes in future exchange rates. This risk is determined by the maturity of planned cash flows as well as the currency of denomination. The longer the maturity the longer is the duration in which possible exchange rate changes can affect cash flows. The currency of denomination influences cash flows by its specific developments and volatilities.
- Quantity risk refers to the uncertain size of cash flows. It is the risk that actual exposures are different from expected exposures (Stulz 2003, p. 224). It is determined by the volume of exposed financial positions denominated in foreign currency. These financial positions are net foreign currency positions, resulting from the balance of foreign currency cash inflows and outflows.

Hence, the effects of exchange rate risk appear in value changes of financial positions due to exchange rate changes in a certain time period.

Furthermore, it is important to differentiate between nominal and real exchange rate changes. The nominal exchange rate is defined as the price of a unit of foreign currency measured in domestic currency. The real exchange rate is defined as the nominal exchange rate corrected for relative prices (Copeland 2000, p. 70). This implies that nominal exchange rate changes result in a real exchange rate change only when the nominal change is not offset by a change in the inflation rate. If the nominal exchange rate changes and changes in the inflation rate offset each other, real exchange rates do not change and relative purchasing power parity exists. Although nominal exchange rate developments show daily changes which can be quite

strong, inflation rates change relatively slow. For this reason, purchasing power parity does not hold in the short to medium term.

The risk of parity changes is described as the uncertainty about the time and extent of changes in currency parities, initiated by currency authorities. It arises if currency authorities have established a fixed exchange rate for each foreign currency – a parity – which can only be changed by the currency authorities. Risk arises for corporations due to the possibility that these parities will be changed. This currency risk category has the same economic consequences as exchange rate risk for corporations. The difference is that these administrative interventions are rarer and can be predicted more easily.

Other types of currency risk are the convertibility risk and the transfer risk. Convertibility risk arises when currency regulators restrict the conversion of currencies. These restrictions can limit volumes and conversion dates. An additional source of risk facing an internationally operating corporation is transfer risk. Transfer risk arises from official restrictions on transferring funds from one currency area into another.

The causes of the risk of parity changes, convertibility risk and transfer risk come from various activities of currency authorities. This is what distinguishes these risks from exchange rate risk.

2 Exposures to the exchange rate risk factor

2.1 Translation exposure

The two basic concepts of quantifying exposure are translation exposure and economic exposure (Fig. 2; see Adler/Dumas 1984, Froot/Scharfstein/Stein 1993). Translation exposure results from the need to convert the financial statements of foreign subsidiaries from the foreign currency to the home currency of the corporation, for the purpose of reporting and consolidation (Shapiro 2003, p. 330). If the translation of a financial position such as assets, liabilities, revenues, expenses, gains and losses in the future will be carried out with the spot rate then prevailing, which is not known for certain in advance, the value of that position in the home currency will be uncertain as well. The possible extent of the gains or losses of reported financial positions due to an exchange rate change is measured by the translation exposure.

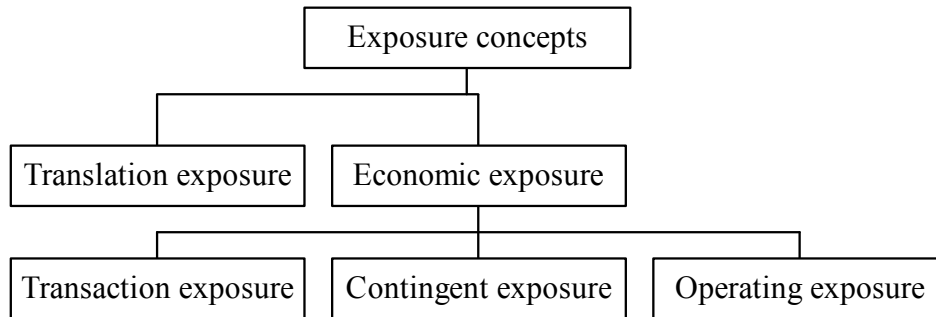


Fig. 2: Categorization of exposure concepts

Some balance-sheet positions might result in future foreign currency payments of the same amount. Therefore, these balance-sheet positions will also be of importance in the establishment of the transaction and economic concepts. However, the translation exposure concept can be delimited specifically from the other two concepts for those balance-sheet positions that will not directly result in payments. An example of this position is a multinational company owning a share of a corporation in another currency area. The process of translating balance-sheet positions from one currency into another can be carried out using several translation methods.

In order to reach a conclusion on the suitability of the translation exposure concept for exchange rate risk management, the explanatory power of balance-sheets in regard to economic performance measurement needs to be assessed. Investors are first and foremost interested in obtained net-payments of a corporation, because these payments determine the amount of the dividend and therefore represent the basis for the consumption position of investors. By contrast, balance-sheet positions do not have a direct influence on the consumption position of investors (Breuer 2000, p. 122). Additional criticism on the translation exposure concept refers to the fact that book-value oriented concepts are based on historic data.

In spite of the arguments presented so far, another argument focuses on the indirect effects of translation exposure management on the ability of corporations to raise funds. This argument becomes important when reported balance-sheet results are perceived as a measure of management performance. In such cases a loss on the balance-sheet can be associated with a decrease in the quality of a corporation's management. This in turn can reduce a corporation's abilities to raise new finance and thus have adverse effects on capabilities to invest.

2.2 Economic exposure

The concept of economic exposure focuses on cash flows. It includes already booked receivables and payables denominated in a foreign currency as well as all potential future cash flows which have, at the time of assessment, uncertain volumes that depend on the development of the exchange rate. Hence, the economic exposure represents possible fluctuations of future cash flows in home currency that are caused by changes in the exchange rate. The economic exposure concept extends the measurement of risk to the long run. Therefore it also intends to describe the consequences of exchange rate changes on the competitive position of a corporation. Thus, it includes both parameters of exchange rate risk, price risk and quantity risk.

According to Shapiro 2003, p. 337, the concept of economic exposure describes the impact of exchange rate changes on the value of a firm. He adopts the view that the economic risk can be measured by the change of the present value of future cash flows that is due to a change in the exchange rate. Thus, a comparison of present values in different exchange rate scenarios shows to what extent future exchange rates influence the value of present cash flows.

The economic exposure concept embodies all cash flows of a corporation. These cash flows can have differing characterizations that make it necessary to further subdivide economic exposure. Contingent exposure, e.g., arises when a corporation takes part in invitations to tender and makes a contractually binding bid for a contract that will create cash flows denominated in foreign currency at some later date. The outcome of the tendering procedure will only be known at a future date. Therefore a position that is exposed to exchange rate risk is created only when the corporation obtains the contract. In case of a successful bid, a company faces exchange rate risk because of possible mismatches in the cash inflows and outflows denominated in foreign currency resulting from this contract.

Operating exposure originates from the effects of currency fluctuations on a company's revenues and costs and therefore on the operating cash flows. The operating exposure is a long-term measure of the effect of exchange rate changes on a corporation's cost and price competitiveness. A corporation is exposed to operating risk when it is engaged in a market that is subject to foreign competition or when it sources inputs in a foreign market. Due to the longer time horizon of the operating exposure, real exchange rate changes give rise to this exposure. Operating exposure originates when changes in the nominal exchange rate are not offset by changes in prices. Consequently, relative prices change. This causes an alteration in the com-

petitive position of a company on its markets. The time pattern of operating exposure, which is long-term, has the effect that this exposure cannot be dealt with only through financial hedging techniques. Long-term operating adjustments need to be made to reduce negative effects of real exchange rate changes.

An advantage of the economic exposure concept is found in its specification of covering the entire planning period of a corporation. Also, it not only includes already booked future transactions into the exchange rate risk analysis, but also transactions resulting from business deals that might be made in the future. That way it takes into account the influence of possible future exchange rate changes on the strategic position of a corporation.

Criticism on the economic exposure outlines the high degree of complexity of a comprehensive economic exposure assessment. In addition, measurement of the economic exposure in certain situations requires subjective assumptions to be made which diminish the objectivity of the assessment.

2.3 Transaction exposure

Transaction exposure originates from various types of a corporation's transactions requiring settlement in foreign currency during a specified time period. Therefore, the transaction exposure concept focuses on cash flows. These are subject to the risk of unfavourable exchange rate changes because they are converted into the corporation's home currency at some later date.

Transaction exposures arise from the following business activities:

- Export and import contracts denominated in foreign currency
- Capital procurement and capital investment contracts denominated in foreign currency
- Inter-company transactions denominated in foreign currency

If transactions take place at several future dates, rather than at one date in the planning period, the transaction exposure of a corporation includes these certain, future foreign currency cash flows. Thus, the transaction exposure has a temporal structure. This characteristic of the transaction exposure can be recorded and presented by a system, that shows the balance of foreign currency cash inflows and outflows, called exposure report. This presentation of the transaction exposure is similar to a liquidity or a financial plan (Pfennig u. Rudolph 2001). In the exposure report the transaction exposure is broken down into currencies, volumes, and

dates. The time period for the transaction exposure and therefore for the exposure report, is the short-term.

Critical assessments of the transaction exposure for exchange rate risk management in finance literature state as an advantage of this concept, its focus on a corporation's future cash flows because future cash flows represent an economically correct basis to measure the value of a corporation. The transaction exposure offers the possibility to carry out sensitivity analysis regarding risk levels under different future exchange rate scenarios. This analysis can be applied for single transactions as well as the total business volume denominated in foreign currency. The simplicity of carrying out such an analysis for transaction exposures is an additional advantage of this concept. Furthermore, the simplicity of application of the transaction exposure for exchange rate risk management, resulting due to the fact that all data can be obtained from corporate financial reporting systems, is judged as a positive aspect.

Assuming the transaction exposure as a fixed amount is a problem. In reality the amount of the transaction exposure can change. This is the case in a situation where the price has to be adjusted later, due to actual costs being significantly higher than planned. Additionally, the amount of the transaction exposure can change when the maturity of a transaction is postponed because of unexpected bad payment behaviour of customers or an unexpected delay in the production resulting in a later delivery of goods. Furthermore, the amount of the transaction exposure cannot be assumed as being fixed when it is uncertain if the underlying business deal will be realised or not. This is the case when a company, e.g., takes part in a bid for a business deal with an already fixed volume and payment dates.

Criticism regarding the transaction exposure concept also points out that this exposure measurement system does not include indirect effects of exchange rate changes but only the direct effect of a possible change in value of a future transaction. Therefore it lacks the analysis on how changes in exchange rates can affect a corporation's sales volume or the competitive position of competitors. For example, an appreciation of the home currency can decrease the sales volume in a foreign market if a company wants to realize a price fixed in home currency. Pringle 1995 outlines in this context that the competitive position of a corporation that sells and sources only in the home currency market is negatively influenced by a home currency appreciation in such a way that it improves the margins of competitors that source abroad.

Tab. 1 highlights the characteristics of the three main exposure concepts covered.

Tab. 1: Comparison of exposure concepts

	Exposure concept		
	Transaction	Translation	Economic
Target	Short-term transactions	Consolidated reporting	Strategic planning
Focus	Cash-flows	Assets and liabilities	Cash-flows
Value orientation	Economic value	Book value	Economic value
Time orientation	Presence-oriented	Past-oriented	Future-oriented
Time period	Limited	Limited	Unlimited

3 Hedging transaction risk using forwards

3.1 Basic hedging positions

Hedging is characterised by all measures taken to achieve protection towards existing exchange rate risks. These actions include the creation of positions that offset the effects of exchange rate changes on already existing or anticipated exposures as well as the matching of exposures to minimize these effects. Hence, the motivation for hedging can be seen in the wish for security and risk avoidance respectively. Speculation can be defined as all measures taken that aim on the realization of profits by departing from the obtainable risk minimizing position.

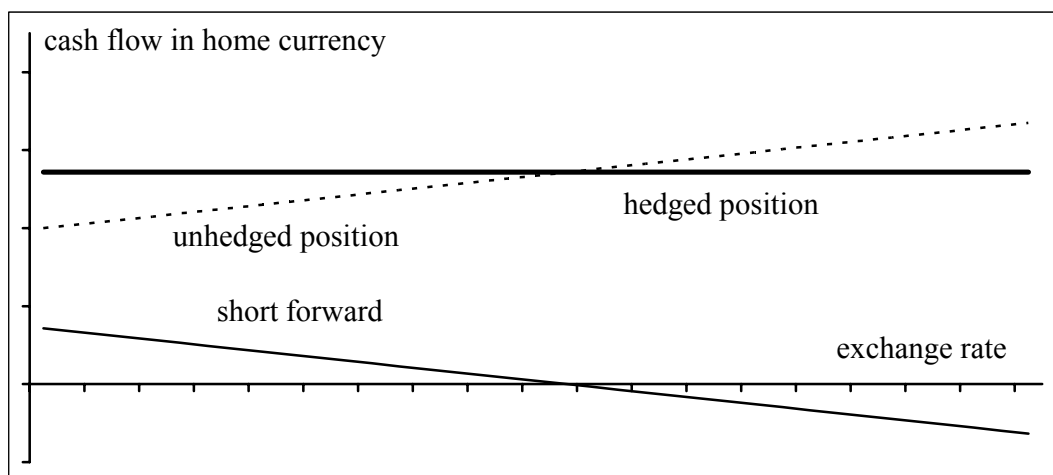


Fig. 3: Short forward hedge

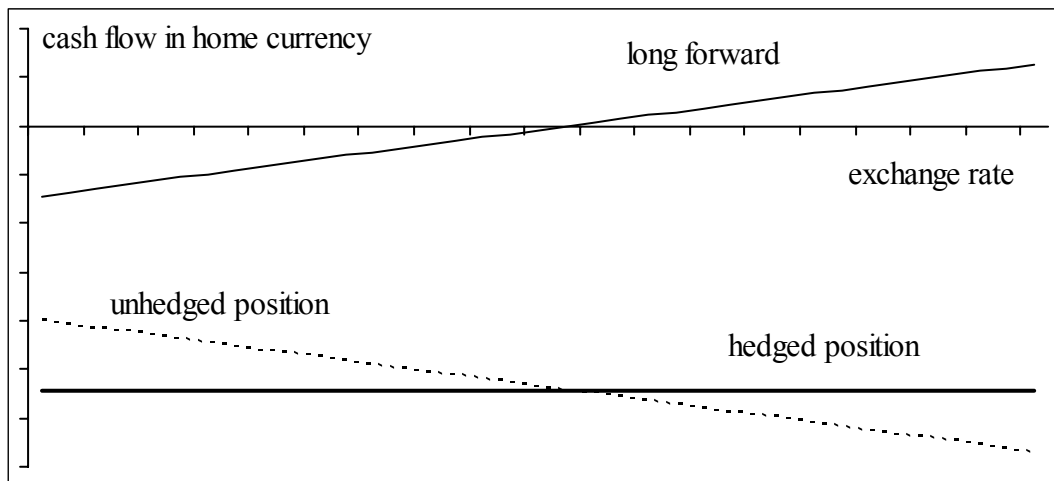


Fig. 4: Long forward hedge

Currency hedging with external instruments has become more popular in industrial companies in the last years (Gebhardt/Ruß 1999). Derivatives like forwards, futures, swaps, vanilla and exotic options offer a wide variety of possible strategies to hedge against transaction risks (Rudolph/Schäfer 2005). Two basic positions – the short and the long forward hedge – are given in fig. 3 and fig. 4.

3.2 Hedging from a utility viewpoint

If a corporation's hedging actions are assessed from a utility viewpoint, hedging specifies measures that maximize the expected utility of a decision maker in such way that the amount of expected cash inflows denominated in home currency will not be influenced. In this context, speculation is characterised by actions taken on foreign exchange markets aiming at increasing expected positive payments (Breuer 2000, p. 134).

Deriving optimal (hedging) positions of a company is a complicated task and addressed widely and controversely in literature (f.e. Breuer 2000, Kürsten 1997, Battermann et al. 2000, Broll/Wahl 1995, Pfennig 1998, Spremann 1991). In focussing on transaction risk only linear risk components are regarded. In such situations the use of options always goes in line with some speculation. Therefore only forward contracts are considered in the following.

The model description refers to some of the fundamental work mentioned above and to Battermann/Broll 2003 and Broll/Wong 2002, especially. In the model we consider a company with an output B produced under the expense of productions costs $c(B)$ and ready for export. The company can sell every unit of the output for the price P_t at a foreign market at some spe-

specified future date t . The future exchange rate at t is unknown, i.e. $S_t = \tilde{S}_t$. So the situation of an existing transaction risk with exposure B is given.

It is assumed that a derivative market exists where the company can trade in currency forwards with forward price F_t under hedging costs k . So the company might decide to hedge a part H of his transaction exposure by a forward position. The hedged volume H can be less than, equal to or more than the foreign amount B . Therefore the unknown future cash flow resulting is

$$\begin{aligned} CF(B, H) &= \overbrace{B \cdot P_t \cdot \tilde{S}_t}^{\text{spot market}} + \overbrace{H \cdot (F_t - \tilde{S}_t)}^{\text{forward market}} - \overbrace{H \cdot F_t \cdot k}^{\text{hedging costs}} - \overbrace{c(B)}^{\text{production costs}} \\ &= (B \cdot P_t - H) \cdot \tilde{S}_t + H \cdot F_t \cdot (1 - k) - c(B) \end{aligned}$$

Taking on the utility viewpoint some assumptions and furthermore a quantification of the companies preferences is required. For that it is assumed that the company maximizes his expected utility by maximizing the future cash flow in a linear preference function of the type

$$\Phi = E(CF) - \frac{\alpha}{2} \cdot \text{var}(CF)$$

The necessary condition for the optimal volume to be exported can easily be calculated as

$$F_t \cdot (1 - k) \cdot P_t = c'(B_{\text{opt}})$$

So it can be concluded that

- the deterministic marginal receipt equals the marginal costs of production
- the optimal export volume is independent of the companies risk aversion
- the optimal export volume is independent of the unknown exchange rate
- the costs of hedging reduce the export volume

Analyzing the optimal hedging volume H , i.e. the optimal hedge ratio h

$$h = H / (B \cdot P_t),$$

we calculate the necessary conditions, too:

$$\frac{\partial \Phi}{\partial H_{\text{opt}}} = -E(\tilde{S}_t) + F_t \cdot (1-k) + \alpha \cdot (B \cdot P_t - H_{\text{opt}}) \cdot \text{var}(\tilde{S}_t) \stackrel{!}{=} 0$$

Straightforward we receive the relation:

$$H_{\text{opt}} = B \cdot P_t - \frac{E(\tilde{S}_t) - F_t \cdot (1-k)}{\alpha \cdot \text{var}(\tilde{S}_t)}$$

Obviously in the case of a perfect forward market without any frictions and therefore also without hedging costs the hedge ratio is equal to one:

$$H_{\text{opt}} = B \cdot P_t$$

Furthermore we can conclude that

- hedging costs reduce the volume of hedging
- the volume of hedging increases in the case of higher exchange rate variance
- the volume of hedging increases in the case of higher risk aversion
- less than the amount $B \cdot P_t$ is „hedged“ if $E(\tilde{S}_t) > F_t \cdot (1-k)$ (normal hedge)
- more than the amount $B \cdot P_t$ is „hedged“ if $E(\tilde{S}_t) < F_t \cdot (1-k)$ (reversed hedge)

Normal and reversed hedge positions can be regarded as speculative positions (Pfennig 1998). In empirical studies a so called 50:50-hedge is often observed (Spremann 1991). Some authors speak of a suboptimal behavior in practice resp. try to get an answer for this phenomenon (Kürsten 1997, Pfennig 1998, Spremann 1991). Compared to forward-hedging options can't be used for hedging in the presented linear model. They could only be motivated in hedging a contingent or an operating exposure (Pfennig 1998).

4 Objectives of exchange rate risk management

As a consequence of the critical assessment of the exposure concepts, corporations should theoretically apply the economic exposure concept in exchange rate risk management. However, due to the high degree of effort that would be needed to achieve a comprehensive economic exposure assessment it is proposed to concentrate corporate exchange rate risk man-

agement efforts with financial derivatives only on a section of the economic exposure, such as transaction exposure.

Exchange rate risk management is a strategic process that aims at the reduction of the vulnerability of corporations with respect to unforeseeable discontinuities of exchange rates. Consequently, exchange rate risk management has to carry out the task of identifying potential risks for a corporation resulting from exchange rate risk changes as well as initiating measures of protection. The action parameters of exchange rate risk management on an operational level are the supervision of currency exposures and the limitation of effects of exchange rate fluctuations on a corporation.

The generic term exchange rate risk management subsumes all measures that aim on the alteration of exposures or exchange rate changes in order to achieve risk-prevention, risk minimization or risk compensation. The most frequently occurring objectives of exchange rate risk management include the following:

- Reduce translation exposure

The achievement of this objective requires a corporation to focus on the protection of foreign currency denominated assets and liabilities from changes in value resulting from exchange rate changes.

- Reduce quarter-to-quarter earning or year-to-year earning fluctuations resulting from exchange rate changes

This objective requires a firm to take translation exposure as well as transaction exposure into consideration.

- Reduce transaction exposure

In order to attain this objective, risk management needs to focus on a part of a corporation's cash flow exposure.

- Reduce economic exposure

Achieving this goal requires a corporation to reduce effects of currency fluctuations on its entire cash flow exposure. Consequently, protection of the corporation's assets and liabilities from changes in exchange rates will be ignored.

- Reduce foreign exchange risk management costs

In order to achieve this goal, a firm must balance off the benefits of hedging with its costs in various situations. It assumes risk neutrality.

- Avoid surprises

This goal requires a company to manage its risk in such a way that large losses due to exchange rate changes are averted.

Shapiro 2003, p. 342, states that the most appropriate way to rank these objectives is according to their ability to contribute to shareholder value maximization. The result of aligning exchange rate risk management with the objective of shareholder wealth maximization is that the concept of economic exposure is, among the objectives described above, the most adequate starting-point for corporate exchange rate risk management. In accordance with this statement the operational objective for exchange rate risk management can be described in the following way: “... *to arrange a firm’s financial affairs in such a way that however the exchange rate may move in the future, the effects on dollar returns are minimized.*” (Shapiro 2003, pp.342-343)

Bibliography

- Adler, M.; Dumas, B.* (1984) Exposure to Currency Risk: Definition and Measurement. In: Financial Management, Vol. 13, pp. 41-50.
- Battermann, H. L.; Bräulke, M.; Broll, U.; Schimmelpfennig, J.* (2000) The preferred hedge instrument. In: Economic Letters, Vol 66, pp 85-91.
- Battermann, H. L.; Broll, U.* (2003) Hedging Strategies using Currency Futures. In: Finance Letters, Vol. 5, No 1.
- Breuer, W.* (2000) Unternehmerisches Währungsmanagement, Wiesbaden.
- Broll, U.; Wahl, J.* (1995) Export Decision and Risk Sharing Markets. In: Zeitschrift für Wirtschafts- und Sozialwissenschaften, Jg. 115, S. 27-36.
- Broll, U.; Wong, K. P.* (2002) Optimal Full-Hedging under State-Dependent Preferences. In: Quarterly Review of Economics and Finance, Vol 42, pp. 937-947.
- Copeland, L.* (2000) Exchange Rates and International Finance, Essex.
- Froot, K. A.; Scharfstein, D. S.; Stein, J. C.* (1993) Risk Management: Coordinating Corporate Investment and Financing Policies. In: Journal of Finance, Vol. 48, pp. 1629-1658.
- Gebhardt, G.; Ruß, O.* (1999) Einsatz von derivativen Finanzinstrumenten im Risikomanagement deutscher Industrieunternehmen. In: Gebhardt, G.; Pellens, B. (Hrsg.) Sonderheft 41 der Zeitschrift für betriebswirtschaftliche Forschung. Düsseldorf, Frankfurt, S. 23-83.
- Kürsten, W.* (1997) Hedgingmodelle, Unternehmensproduktion und antizipatorisch-simultanes Risikomanagement. In: Franke, G. (Hrsg.) Sonderheft 38 der Zeitschrift für betriebswirtschaftliche Forschung, Düsseldorf, Frankfurt, S. 127-154.
- Pfennig, M.* (1998) Optimale Steuerung des Währungsrisikos mit derivativen Instrumenten, Wiesbaden.
- Pfennig, M.; Rudolph, B.* (2001) Währungs-Futures und -Forwards. In: Achleitner, A.-K.; Thoma, G. (Hrsg.) Handbuch Corporate Finance, Loseblattwerk, Köln, Kap. 8.2.1.
- Pringle, J.* (1995) A Look at Indirect Foreign Currency Exposure. In: Journal of Applied Corporate Finance, Vol. 8, pp. 75-81.
- Rudolph, B.; Schäfer, K.* (2005) Derivative Finanzmarktinstrumente, Berlin et al.
- Shapiro, A.* (2003) Multinational Financial Management, New York.
- Spremann, K.* (1991) Kann man mit Terminkontrakten hedgen? In: Zeitschrift für betriebswirtschaftliche Forschung, Jg. 43, S. 295-312.
- Stulz, R. M.* (2003) Risk Management & Derivatives, Mason, Ohio.

**List of Working Papers of the Faculty of Economics and Business Administration,
Technische Universität Bergakademie Freiberg.**

2000

- 00/1 Michael Nippa, Kerstin Petzold, Ökonomische Erklärungs- und Gestaltungsbeiträge des Realoptionen-Ansatzes, Januar.
- 00/2 Dieter Jacob, Aktuelle baubetriebliche Themen – Sommer 1999, Januar.
- 00/3 Egon P. Franck, Gegen die Mythen der Hochschulreformdiskussion – Wie Selektionsorientierung, Nonprofit-Verfassungen und klassische Professorenbeschäftigungsverhältnisse im amerikanischen Hochschulwesen zusammenpassen, erscheint in: *Zeitschrift für Betriebswirtschaft (ZfB)*, 70. (2000).
- 00/4 Jan Körnert, Unternehmensgeschichtliche Aspekte der Krisen des Bankhauses Barings 1890 und 1995, in: *Zeitschrift für Unternehmensgeschichte*, München, 45 (2000), 205 – 224.
- 00/5 Egon P. Franck, Jens Christian Müller, Die Fußball-Aktie: Zwischen strukturellen Problemen und First-Mover-Vorteilen, *Die Bank*, Heft 3/2000, 152 – 157.
- 00/6 Obeng Mireku, Culture and the South African Constitution: An Overview, Februar.
- 00/7 Gerhard Ring, Stephan Oliver Pfaff, CombiCar: Rechtliche Voraussetzungen und rechtliche Ausgestaltung eines entsprechenden Angebots für private und gewerbliche Nutzer, Februar.
- 00/8 Michael Nippa, Kerstin Petzold, Jamina Bartusch, Neugestaltung von Entgeltsystemen, Besondere Fragestellungen von Unternehmen in den Neuen Bundesländern – Ein Beitrag für die Praxis, Februar.
- 00/9 Dieter Welz, Non-Disclosure and Wrongful Birth , Avenues of Liability in Medical Malpractice Law, März.
- 00/10 Jan Körnert, Karl Lohmann, Zinsstrukturbasierte Margenkalkulation, Anwendungen in der Marktzinsmethode und bei der Analyse von Investitionsprojekten, März.
- 00/11 Michael Fritsch, Christian Schwirten, R&D cooperation between public research institutions - magnitude, motives and spatial dimension, in: Ludwig Schätzl und Javier Revilla Diez (eds.), *Technological Change and Regional Development in Europe*, Heidelberg/New York 2002: Physica, 199 – 210.
- 00/12 Diana Grosse, Eine Diskussion der Mitbestimmungsgesetze unter den Aspekten der Effizienz und der Gerechtigkeit, März.
- 00/13 Michael Fritsch, Interregional differences in R&D activities – an empirical investigation, in: *European Planning Studies*, 8 (2000), 409 – 427.
- 00/14 Egon Franck, Christian Opitz, Anreizsysteme für Professoren in den USA und in Deutschland – Konsequenzen für Reputationsbewirtschaftung, Talentallokation und die Aussagekraft akademischer Signale, in: *Zeitschrift Führung + Organisation (zfo)*, 69 (2000), 234 – 240.
- 00/15 Egon Franck, Torsten Pudack, Die Ökonomie der Zertifizierung von Managemententscheidungen durch Unternehmensberatungen, April.
- 00/16 Carola Jungwirth, Inkompatible, aber dennoch verzahnte Märkte: Lichtblicke im angespannten Verhältnis von Organisationswissenschaft und Praxis, Mai.
- 00/17 Horst Brezinski, Der Stand der wirtschaftlichen Transformation zehn Jahre nach der Wende, in: Georg Brunner (Hrsg.), *Politische und ökonomische Transformation in Osteuropa*, 3. Aufl., Berlin 2000, 153 – 180.
- 00/18 Jan Körnert, Die Maximalbelastungstheorie Stützel als Beitrag zur einzelwirtschaftlichen Analyse von Dominoeffekten im Bankensystem, in: Eberhart Ketzler, Stefan Prigge u. Hartmut Schmidt (Hrsg.), *Wolfgang Stützel – Moderne Konzepte für Finanzmärkte, Beschäftigung und Wirtschaftsverfassung*, Verlag J. C. B. Mohr (Paul Siebeck), Tübingen 2001, 81 – 103.
- 00/19 Cornelia Wolf, Probleme unterschiedlicher Organisationskulturen in organisationalen Subsystemen als mögliche Ursache des Konflikts zwischen Ingenieuren und Marketingexperten, Juli.
- 00/20 Egon Franck, Christian Opitz, Internet-Start-ups – Ein neuer Wettbewerber unter den „Filteranlagen“ für Humankapital, erscheint in: *Zeitschrift für Betriebswirtschaft (ZfB)*, 70 (2001).

- 00/21 Egon Franck, Jens Christian Müller, Zur Fernsehvermarktung von Sportligen: Ökonomische Überlegungen am Beispiel der Fußball-Bundesliga, erscheint in: Arnold Hermanns und Florian Riedmüller (Hrsg.), *Management-Handbuch Sportmarketing*, München 2001.
- 00/22 Michael Nippa, Kerstin Petzold, Gestaltungsansätze zur Optimierung der Mitarbeiter-Bindung in der IT-Industrie - eine differenzierende betriebswirtschaftliche Betrachtung -, September.
- 00/23 Egon Franck, Antje Musil, Qualitätsmanagement für ärztliche Dienstleistungen – Vom Fremd- zum Selbstmonitoring, September.
- 00/24 David B. Audretsch, Michael Fritsch, Growth Regimes over Time and Space, *Regional Studies*, 36 (2002), 113 – 124.
- 00/25 Michael Fritsch, Grit Franke, Innovation, Regional Knowledge Spillovers and R&D Cooperation, *Research Policy*, 33 (2004), 245-255.
- 00/26 Dieter Slaby, Kalkulation von Verrechnungspreisen und Betriebsmittelmieten für mobile Technik als Grundlage innerbetrieblicher Leistungs- und Kostenrechnung im Bergbau und in der Bauindustrie, Oktober.
- 00/27 Egon Franck, Warum gibt es Stars? – Drei Erklärungsansätze und ihre Anwendung auf verschiedene Segmente des Unterhaltungsmarktes, *Wirtschaftsdienst – Zeitschrift für Wirtschaftspolitik*, 81 (2001), 59 – 64.
- 00/28 Dieter Jacob, Christop Winter, Aktuelle baubetriebliche Themen – Winter 1999/2000, Oktober.
- 00/29 Michael Nippa, Stefan Dirlich, Global Markets for Resources and Energy – The 1999 Perspective - , Oktober.
- 00/30 Birgit Plewka, Management mobiler Gerätetechnik im Bergbau: Gestaltung von Zeitfondsgliederung und Ableitung von Kennziffern der Auslastung und Verfügbarkeit, Oktober.
- 00/31 Michael Nippa, Jan Hachenberger, Ein informationsökonomisch fundierter Überblick über den Einfluss des Internets auf den Schutz Intellektuellen Eigentums, Oktober.
- 00/32 Egon Franck, The Other Side of the League Organization – Efficiency-Aspects of Basic Organizational Structures in American Pro Team Sports, Oktober.
- 00/33 Jan Körnert, Cornelia Wolf, Branding on the Internet, Umbrella-Brand and Multiple-Brand Strategies of Internet Banks in Britain and Germany, erschienen in Deutsch: *Die Bank*, o. Jg. (2000), 744 – 747.
- 00/34 Andreas Knabe, Karl Lohmann, Ursula Walther, Kryptographie – ein Beispiel für die Anwendung mathematischer Grundlagenforschung in den Wirtschaftswissenschaften, November.
- 00/35 Gunther Wobser, Internetbasierte Kooperation bei der Produktentwicklung, Dezember.
- 00/36 Margit Enke, Anja Geigenmüller, Aktuelle Tendenzen in der Werbung, Dezember.

2001

- 01/1 Michael Nippa, Strategic Decision Making: Nothing Else Than Mere Decision Making? Januar.
- 01/2 Michael Fritsch, Measuring the Quality of Regional Innovation Systems – A Knowledge Production Function Approach, *International Regional Science Review*, 25 (2002), 86-101.
- 01/3 Bruno Schönfelder, Two Lectures on the Legacy of Hayek and the Economics of Transition, Januar.
- 01/4 Michael Fritsch, R&D-Cooperation and the Efficiency of Regional Innovation Activities, *Cambridge Journal of Economics*, 28 (2004), 829-846.
- 01/5 Jana Eberlein, Ursula Walther, Änderungen der Ausschüttungspolitik von Aktiengesellschaften im Lichte der Unternehmenssteuerreform, *Betriebswirtschaftliche Forschung und Praxis*, 53 (2001), 464 - 475.
- 01/6 Egon Franck, Christian Opitz, Karriereverläufe von Topmanagern in den USA, Frankreich und Deutschland – Elitenbildung und die Filterleistung von Hochschulsystemen, *Schmalenbachs Zeitschrift für betriebswirtschaftliche Forschung (zfbf)*, (2002).
- 01/7 Margit Enke, Anja Geigenmüller, Entwicklungstendenzen deutscher Unternehmensberatungen, März.

- 01/8 Jan Körnert, The Barings Crises of 1890 and 1995: Causes, Courses, Consequences and the Danger of Domino Effects, *Journal of International Financial Markets, Institutions & Money*, 13 (2003), 187 – 209.
- 01/9 Michael Nippa, David Finegold, Deriving Economic Policies Using the High-Technology Ecosystems Approach: A Study of the Biotech Sector in the United States and Germany, April.
- 01/10 Michael Nippa, Kerstin Petzold, Functions and roles of management consulting firms – an integrative theoretical framework, April.
- 01/11 Horst Brezinski, Zum Zusammenhang zwischen Transformation und Einkommensverteilung, Mai.
- 01/12 Michael Fritsch, Reinhold Grotz, Udo Brixy, Michael Niese, Anne Otto, Gründungen in Deutschland: Datenquellen, Niveau und räumlich-sektorale Struktur, in: Jürgen Schmude und Robert Leiner (Hrsg.), *Unternehmensgründungen - Interdisziplinäre Beiträge zum Entrepreneurship Research*, Heidelberg 2002: Physica, 1 – 31.
- 01/13 Jan Körnert, Oliver Gaschler, Die Bankenkrise in Nordeuropa zu Beginn der 1990er Jahre - Eine Sequenz aus Deregulierung, Krise und Staatseingriff in Norwegen, Schweden und Finnland, *Kredit und Kapital*, 35 (2002), 280 – 314.
- 01/14 Bruno Schönfelder, The Underworld Revisited: Looting in Transition Countries, Juli.
- 01/15 Gert Ziener, Die Erdölwirtschaft Russlands: Gegenwärtiger Zustand und Zukunftsaussichten, September.
- 01/16 Margit Enke, Michael J. Schäfer, Die Bedeutung der Determinante Zeit in Kaufentscheidungsprozessen, September.
- 01/17 Horst Brezinski, 10 Years of German Unification – Success or Failure? September.
- 01/18 Diana Grosse, Stand und Entwicklungschancen des Innovationspotentials in Sachsen in 2000/2001, September.

2002

- 02/1 Jan Körnert, Cornelia Wolf, Das Ombudsmannverfahren des Bundesverbandes deutscher Banken im Lichte von Kundenzufriedenheit und Kundenbindung, in: *Bank und Markt*, 31 (2002), Heft 6, 19 – 22.
- 02/2 Michael Nippa, The Economic Reality of the New Economy – A Fairytale by Illusionists and Opportunists, Januar.
- 02/3 Michael B. Hinner, Tessa Rülke, Intercultural Communication in Business Ventures Illustrated by Two Case Studies, Januar.
- 02/4 Michael Fritsch, Does R&D-Cooperation Behavior Differ between Regions? *Industry and Innovation*, 10 (2003), 25-39.
- 02/5 Michael Fritsch, How and Why does the Efficiency of Regional Innovation Systems Differ? in: Johannes Bröcker, Dirk Dohse and Rüdiger Soltwedel (eds.), *Innovation Clusters and Interregional Competition*, Berlin 2003: Springer, 79-96.
- 02/6 Horst Brezinski, Peter Seidelmann, Unternehmen und regionale Entwicklung im ostdeutschen Transformationsprozess: Erkenntnisse aus einer Fallstudie, März.
- 02/7 Diana Grosse, Ansätze zur Lösung von Arbeitskonflikten – das philosophisch und psychologisch fundierte Konzept von Mary Parker Follett, Juni.
- 02/8 Ursula Walther, Das Äquivalenzprinzip der Finanzmathematik, Juli.
- 02/9 Bastian Heinecke, Involvement of Small and Medium Sized Enterprises in the Private Realisation of Public Buildings, Juli.
- 02/10 Fabiana Rossaro, Der Kreditwucher in Italien – Eine ökonomische Analyse der rechtlichen Handhabung, September.
- 02/11 Michael Fritsch, Oliver Falck, New Firm Formation by Industry over Space and Time: A Multi-Level Analysis, Oktober.
- 02/12 Ursula Walther, Strategische Asset Allokation aus Sicht des privaten Kapitalanlegers, September.

02/13 Michael B. Hinner, Communication Science: An Integral Part of Business and Business Studies? Dezember.

2003

03/1 Bruno Schönfelder, Death or Survival. Post Communist Bankruptcy Law in Action. A Survey, Januar.

03/2 Christine Pieper, Kai Handel, Auf der Suche nach der nationalen Innovationskultur Deutschlands – die Etablierung der Verfahrenstechnik in der BRD/DDR seit 1950, März.

03/3 Michael Fritsch, Do Regional Systems of Innovation Matter? in: Kurt Huebner (ed.): *The New Economy in Transatlantic Perspective - Spaces of Innovation*, Abingdon 2005: Routledge, 187-203.

03/4 Michael Fritsch, Zum Zusammenhang zwischen Gründungen und Wirtschaftsentwicklung, in Michael Fritsch und Reinhold Grotz (Hrsg.), *Empirische Analysen des Gründungsgeschehens in Deutschland*, Heidelberg 2004: Physica 199-211.

03/5 Tessa Rülke, Erfolg auf dem amerikanischen Markt

03/6 Michael Fritsch, Von der innovationsorientierten Regionalförderung zur regionalisierten Innovationspolitik, in: Michael Fritsch (Hrsg.): *Marktdynamik und Innovation – Zum Gedenken an Hans-Jürgen Ewers*, Berlin 2004: Duncker & Humblot, 105-127.

03/7 Isabel Opitz, Michael B. Hinner (Editor), Good Internal Communication Increases Productivity, Juli.

03/8 Margit Enke, Martin Reimann, Kulturell bedingtes Investorenverhalten – Ausgewählte Probleme des Kommunikations- und Informationsprozesses der Investor Relations, September.

03/9 Dieter Jacob, Christoph Winter, Constanze Stuhr, PPP bei Schulbauten – Leitfaden Wirtschaftlichkeitsvergleich, Oktober.

03/10 Ulrike Pohl, Das Studium Generale an der Technischen Universität Bergakademie Freiberg im Vergleich zu Hochschulen anderer Bundesländer (Niedersachsen, Mecklenburg-Vorpommern) – Ergebnisse einer vergleichenden Studie, November.

2004

04/1 Michael Fritsch, Pamela Mueller, The Effects of New Firm Formation on Regional Development over Time, *Regional Studies*, 38 (2004), 961-975.

04/2 Michael B. Hinner, Mirjam Dreisörner, Antje Felich, Manja Otto, Business and Intercultural Communication Issues – Three Contributions to Various Aspects of Business Communication, Januar.

04/3 Michael Fritsch, Andreas Stephan, Measuring Performance Heterogeneity within Groups – A Two-Dimensional Approach, Januar.

04/4 Michael Fritsch, Udo Brixy, Oliver Falck, The Effect of Industry, Region and Time on New Business Survival – A Multi-Dimensional Analysis, Januar.

04/5 Michael Fritsch, Antje Weyh, How Large are the Direct Employment Effects of New Businesses? – An Empirical Investigation, März.

04/6 Michael Fritsch, Pamela Mueller, Regional Growth Regimes Revisited – The Case of West Germany, in: Michael Dowling, Jürgen Schmude and Dodo von Knyphausen-Aufsess (eds.): *Advances in Interdisciplinary European Entrepreneurship Research Vol. II*, Münster 2005: LIT, 251-273.

04/7 Dieter Jacob, Constanze Stuhr, Aktuelle baubetriebliche Themen – 2002/2003, Mai.

04/8 Michael Fritsch, Technologietransfer durch Unternehmensgründungen – Was man tun und realistischerweise erwarten kann, in: Michael Fritsch and Knut Koschatzky (eds.): *Den Wandel gestalten – Perspektiven des Technologietransfers im deutschen Innovationssystem*, Stuttgart 2005: Fraunhofer IRB Verlag, 21-33.

04/9 Michael Fritsch, Entrepreneurship, Entry and Performance of New Businesses – Compared in two Growth Regimes: East and West Germany, in: *Journal of Evolutionary Economics*, 14 (2004), 525-542.

- 04/10 Michael Fritsch, Pamela Mueller, Antje Weyh, Direct and Indirect Effects of New Business Formation on Regional Employment, Juli.
- 04/11 Jan Körnert, Fabiana Rossaro, Der Eigenkapitalbeitrag in der Marktzinsmethode, in: *Bank-Archiv* (ÖBA), Springer-Verlag, Berlin u. a., ISSN 1015-1516. Jg. 53 (2005), Heft 4, 269-275.
- 04/12 Michael Fritsch, Andreas Stephan, The Distribution and Heterogeneity of Technical Efficiency within Industries – An Empirical Assessment, August.
- 04/13 Michael Fritsch, Andreas Stephan, What Causes Cross-industry Differences of Technical Efficiency? – An Empirical Investigation, November.
- 04/14 Petra Rüniger, Ursula Walther, Die Behandlung der operationellen Risiken nach Basel II - ein Anreiz zur Verbesserung des Risikomanagements? Dezember.

2005

- 05/1 Michael Fritsch, Pamela Mueller, The Persistence of Regional New Business Formation-Activity over Time – Assessing the Potential of Policy Promotion Programs, Januar.
- 05/2 Dieter Jacob, Tilo Uhlig, Constanze Stuhr, Bewertung der Immobilien von Akutkrankenhäusern der Regelversorgung unter Beachtung des neuen DRG-orientierten Vergütungssystems für stationäre Leistungen, Januar.
- 05/3 Alexander Eickelpasch, Michael Fritsch, Contests for Cooperation – A New Approach in German Innovation Policy, April.
- 05/4 Fabiana Rossaro, Jan Körnert, Bernd Nolte, Entwicklung und Perspektiven der Genossenschaftsbanken Italiens, in: *Bank-Archiv* (ÖBA), Springer-Verlag, Berlin u. a., ISSN 1015-1516, Jg. 53 (2005), Heft 7, 466-472.
- 05/5 Pamela Mueller, Entrepreneurship in the Region: Breeding Ground for Nascent Entrepreneurs? Mai.
- 05/6 Margit Enke, Larissa Greschuchna, Aufbau von Vertrauen in Dienstleistungsinteraktionen durch Instrumente der Kommunikationspolitik – dargestellt am Beispiel der Beratung kleiner und mittlerer Unternehmen, Mai.
- 05/7 Bruno Schönfelder, The Puzzling Underuse of Arbitration in Post-Communism – A Law and Economics Analysis. Juni.
- 05/8 Andreas Knabe, Ursula Walther, Zur Unterscheidung von Eigenkapital und Fremdkapital – Überlegungen zu alternativen Klassifikationsansätzen der Außenfinanzierung, Juli.
- 05/9 Andreas Ehrhardt, Michael Nippa, Far better than nothing at all - Towards a contingency-based evaluation of management consulting services, Juli
- 05/10 Loet Leydesdorff, Michael Fritsch, Measuring the Knowledge Base of Regional Innovation Systems in Germany in terms of a Triple Helix Dynamics, Juli.
- 05/11 Margit Enke, Steffi Poznanski, Kundenintegration bei Finanzdienstleistungen, Juli.
- 05/12 Olga Minuk, Fabiana Rossaro, Ursula Walther, Zur Reform der Einlagensicherung in Weißrussland - Kritische Analyse und Vergleich mit dem Deutschen Einlagensicherungssystem, August.
- 05/13 Brit Arnold, Larissa Greschuchna, Hochschulen als Dienstleistungsmarken – Besonderheiten beim Aufbau einer Markenidentität, August.
- 05/14 Bruno Schönfelder, The Impact of the War 1991 – 1995 on the Croatian Economy – A Contribution to the Analysis of War Economies, August.
- 05/15 Michael Fritsch, Viktor Slavtchev, The Role of Regional Knowledge Sources for Innovation – An Empirical Assessment, August.
- 05/16 Pamela Mueller, Exploiting Entrepreneurial Opportunities: The Impact of Entrepreneurship on Economic Growth, August.
- 05/17 Pamela Mueller, Exploring the Knowledge Filter: How Entrepreneurship and University-Industry Relations Drive Economic Growth, September.

05/18 Marc Rodt, Klaus Schäfer, Absicherung von Strompreisisiken mit Futures: Theorie und Empirie, September.