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The Cashflow and Capital Congruent Market Opportunity in the *Marktzinsmethode*

Esther IJskes

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Esther IJskes

Vrije Universiteit Amsterdam

Faculty of Economics, Business Administration, and Econometrics

Department of Accounting

De Boelelaan 1105, room 3A-38

1081 HV Amsterdam

The Netherlands

phone: +3 1 20 444 6076

fax: +31 20 444 6005

email: eijskes@econ.vu.nl

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Esther IJskes
Vrije Universiteit Amsterdam

Synopsis and introduction

Interest income is the main source of income to commercial banks. The assignment of interest income to banking products is called funds transfer pricing. Traditionally, funds transfer pricing systems were tost-based; the transfer rate was based on the average costs of funds. In the seventies the shortcomings of a tost-based transfer rate were recognized and a market-based funds transfer rate was suggested as a solution (Haskins & Sells 1972, 174). At that time a single, short-term market rate was suggested as the funds transfer rate for all funds (ibid). Although it was recognized that a single market rate did not reflect differences in maturity and interest rate risk (Tewes 1976, 32), no further efforts were initiated to overcome these shortcomings.

In Germany, on the contrary, a lot of effort has been devoted to the development of a funds transfer pricing system that supports the planning and control of customer loans and deposits. The first publications explicitly articulating the need for a market-oriented funds transfer pricing system date from 1982. From that moment on many articles and books on this subject were published, and the *Marktzinsmethode* was developed. Since the *Marktzinsmethode* developed independently from foreign influences and has received little attention in non-German literature, an overview of this method is useful.

This paper aims at describing *the Markkinsmethode* as it developed in German literature. Attention will be paid to the reasons for developing a market-based funds transfer pricing system. The opportunity principle will be introduced as a means of assigning interest income. As a result of the use of the opportunity principle three sources of interest income are recognized: interest income from loans, deposits, and maturity mismatch, as will be illustrated with an example.

The second part of the paper concentrates on the application of the opporhmity principle. This principle states that the interest contribution of a customer deposit or loan is determined by comparison with a market opportunity. With regard to the construction of the market

opportunity two principles are discussed. The cashflow congruence principle holds that the customer loan or deposit should be compared to a market opportunity with the same future cashflow pattem, while the capital congruence principle states that it should be compared to a market opportunity with equal invested capital. Different applications of these concepts will be presented, one of them being the *Barwertkonzept*. This approach gained wide acceptance in German literature. Finally, some remarks on *the Marktzinsmethode* will be made and attention is paid to implementation in practice.

Keywords: product costing, interest allocation, banks

1. Basic model of the *Marktzinsmethode*

Origin of the Marktzinsmethode

The development of the *Marktzinsmethode* was a consequence of the shortcomings of the tost-based funds transfer pricing systems for planning and controlling customer loans and deposits. In a tost-based funds transfer pricing system the transfer rate is based on the average costs of funds,[1] and depends on:

- the pooling of funds which is based on arbitrary chosen criteria;
- tbe changing composition of funds in a pool over time, due to new loans and deposits and the phasing-out of past loans and deposits; and
- the historical interest rates of loans and deposits of a pool.

As a result of this the pricing of customer loans is based on a transfer rate that is historical oriented and dependent on other loans and deposits. Further the performance of an unchanged loan or deposit changes over time as the transfer rate changes, while no control possibilities exist except at origination. Thus tost-based transfer pricing systems are not suited for planning and controlling customer loans and deposits, because the transfer rate has no causal relationship with the customer deposit or loan (Flechsig and Flesch 1982, 455/6; Flesch, Piaskowski, and Sievi 1984, 357; Flechsig 1985, 300/1).

Flechsig (1982), when discussing deposit pricing, introduced anotber approach in which

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[1] In the single pool method (*Poolmethode*) the average cost of funds is calculated by dividing annual interest expenses by the average balance of deposits. Tbe resulting rate is used as a cost rate for loans. In tbe multiple pool method (*Schichtenbilanz*) tbe same approach is followed, but tbe funds are categorized in pools according to maturity, volatility or other criteria. For each pool a transfer rate is calculated based on the average cost of funds of tbat pool. For an overview of these methods see Haskins and Sells (1972, chapter 11) and Schierenbeck (1985, 66-78; 1994, 55-68).

the maximum rate against which the bank will take funds from customers in deposit is determined by alternative sources of funds. As deposits are a relatively cheap source of funds, deposit interest income is determined by cost savings compared to altemative, more expensive market funds (see also Droste et al. 1983, 317).

With this statement Flechsig introduced the opportunity principle, explicitly referring to financial markets. Although Flechsig concentrated on deposit pricing decisions only, and did not in this article seem to aim at a funds transfer pricing system, his article was an important sign of coming developments. The first descriptions of a complete funds transfer pricing system are found in Flechsig and Flesch (1982) and Flesch, Piaskowski, and Sievi (1984).[2]

Basic model of the Marktzinsmethode

The main characteristic of *the Marktzinsmethode* is the application of the opportunity principle. This principle states that a transaction with a customer[3] should be compared to a market opportunity with the same characteristics. The interest income of a customer transaction[4] is calculated by multiplying the interest margin — that is the difference between the customer interest rate and interest rate of the market opportunity — with the volume of the transaction.

Loan interest contribution = (customer interest rate -/- opporhmity rate) * volume
Deposit interest contribution = (opportunity rate -/- customer interest rate) * volume

Unless a completely matched balance sheet exists, the opportunity rates and volumes of the bank's loans will not match completely with the opportunity rates and volumes of the deposits. As a result of this a third source of income, the mismatch contribution,[5] is recognized (Flechsig and Flesch 1982, 457; Droste et al. 1983, 317; Flesch, Piaskowski, and Sievi 1984, 358). The mismatch contribution is identified as a separate source of income, and should not be allocated to the loan and deposit transactions, because it can be generated with

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[2] In both these articles the term *Wertsteuerung* is used to indicate the use of market rates fot performance measurement. The term *Marktzinsmethode* was introduced by Flechsig (1983, 161).

[3] A customer transaction is defined as a separate loan or deposit arrangement between the bank and a customer. A customer transaction consists of arrangements on the principal, repayment schedule, interest rates, payment dates, etc. It is equivalent to the German term *Einzelgeschäft*.

[4] The German term for customer interest contribution is *Konditionsbeitrag*. *Kondition* refers to the conditions that are incorporated in the arrangement with the customer.

[5] This contribution was first called the contribution of *Zentraldisposition*, a centralized organizational unit (treasury), responsible for implementing interest rate management and the like. Later on this contribution *was* called *Strukturbeitrag* or *Transformationsergebnis*.

the sole use of market transactions (Flesch, Piaskowski, and Sievi 1984, 358; Schierenbeck and Rolfes 1988b, 32).

The Marktzinsmethode is illustrated with an example. Assume a bank has three loans and three deposits as mentioned in the following table:

Loans:	Deposits:
500 000 for 5 years at 8%	200 000 for 5 years at 6%
300 000 for 3 years at 7%	250 000 for 3 years at 5%
100 000 for 1 year at 6%	450000for 1 year at 4%

Net interest income, the difference between the interest revenues and interest expenses, amounts to 67 000 -/- 42 500 = 24 500, as is illustrated below.

500 000 @ 8% =	40 000	200 000 @ 6% =	12000
300 000 @ 7% =	21 000	250 000 @ 5% =	12 500
100 000 @ 6% =	6 000	450 000 @ 4% =	18 000
Interest revenue	67 000	Interest expenses	42 500

Net interest income = 67 000 -/- 42 500 = 24 500

Assume that the market interest rates for respectively 1, 3 and 5 years are 5%, 6%, and 7%. The application of ***the Marktzinsmethode*** will result in the following table:

Loans:		Deposits:	
500 000 @ (8%-7%) =	5 000	200 000 @ (7%-6%) =	2000
300 000 @ (7%-6%) =	3000	250 000 @ (6%-5%) =	2500
100 000 @ (6%-5%) =	1 000	450 000 @ (5%-4%) =	4 500
Loan contribution	9000	Deposit contribution	9 000

The interest income is determined for each loan and deposit separately. The total of the customer interest contributions does not equal net interest income. The residual interest income is the mismatch contribution, and amounts to 24 500 -/- 18 000 = 6 500.

It is important to note that the market opportunity is a risk-free opportunity and does not include customer specific risk, like credit risk. As a consequence interest income of a customer transaction should cover customer specific risks and operational costs, and contribute to profits.

Requirement of the Marktzinsmethode

The Marktzinsmethode requires that interest income of each separate loan and deposit should be measured. For planning and control purposes the interest allocation should meet the following demands:

- the interest margin and the interest income of a customer transaction should measure the economic performance of a particular loan or deposit with respect to interest;

- the interest margin and interest income of a customer transaction should be determined for each transaction separately, and should not depend on other customer transactions (Schierenbeck and Rolfes 1988b, 13);
- if all expected circumstances are realized, the ex-post interest margin and interest contribution should equal the ex-ante interest margin and interest contribution;
- the market opportunity should be a realistic opportunity to the bank's treasury; and
- the calculated customer interest contributions should fit into the financial information system; the funds transfer pricing system should comply with the bookkeeping records (Schierenbeck and Rolfes 1988b, 18).

The Murktzinsmethode was developed to meet these demands. An central issue in the application of *the Marktzinsmethode* concerns the comparability of the market opportunity to the customer transaction, because the market opportunity is used as a benchmark to determine the benefits of the customer transaction. This issue will be discussed in the next section.

II. The market opportunity

The opportunity principle states that a customer transaction should be compared to a market opportunity. The comparison should not be based on just any available market opportunity, but on one that is comparable to the customer transaction. In general terms this comparability is called *Laufzeitkongruenz*. This means the market transaction should resemble the customer transaction, for example in maturity or interest fixation.[6]

One of the premises of *the Murktzinsmethode* is that the interest contribution of the customer transaction should only be based on controllable factors. Since the decisions regarding the customer interest rate and the volume of the transaction are made at origination, the market conditions at origination are used to determine the opportunity rate (Flechsig and Flesch 1982, 460/464; Droste et al. 1983, 314; Flesch, Piaskowski, and Sievi 1984, 358).

Fixed-rated transactions can have full repayment at maturity — like a bullet loan —, or intermediate repayments during maturity — like an installment loan —. At the financial markets only fixed-rated transactions with full repayment at maturity are traded. Therefore it is not too difficult to find market opportunities that can serve as a base for comparison to fixed-rated

[6] Because *Laufzeit* is a general term indicating a time period, it is not directly clear if it aims at the time the capital is invested — contractual maturity or remaining life, or *in* German *Kapitalbindung* — or the time until the repricing *date* — *in* German *Zinsbindung*.

customer transactions repayable at maturity. Usually, the repricing date is before maturity. As the customer interest rate will be renegotiated again at the repricing date, the renewed transaction can be seen as an completely new transaction (Droste et al. 1983, footnote 1; Flechsig and Flesch 1982, 460). Therefore the interest fixation period is favored as the basis for selecting a market opportunity (Flesch, Piaskowski, and Sievi 1984, 360).

The application of this decision rule would result in exactly the same opportunity rate for customer transactions with and without amortizations (Flesch, Piaskowski, and Sievi 1984,363; Banken 1987, 252). Thus a three-years customer loan, repayable at maturity will be compared to a three-years market loan. A three-years customer loan with annual amortizations will be compared to the same market loan. It is clear that the second customer loan differs from the first, which should be reflected in the market opportunity rate.

As amortized transactions are not available on the financial markets, the idea was developed that in these cases the market opportunity consists of a bundle of market transactions. Therefore the market opportunity should be constructed. As the basis for construction of the market opportunity two principles exist, cashflow congruence and capital congruence. A cashflow congruent market opportunity has an identical future cashflow pattern as the customer transaction. At origination a cashflow surplus exists, representing the value of future interest income of the customer transaction. A capital congruent market opportunity is characterized by equal invested capital and amortizations over maturity. Future cashflow surpluses represent future interest income. These two principles will be discussed in the next two sections.

III. Cashflow congruence

The cashflow congruence[7] principle was developed to exclude the return resulting from reinvesting intermediate cashflows from the customer interest contribution, as these are not controllable at origination. Therefore a market opportunity with exactly the same but reverse future cashflows is constructed. In that way the future cashflows from the market opportunity compensate the future customer cashflows, and no cashflow surpluses or deficits have to be invested or financed. The return associated with reinvestment risk is eliminated (Flesch, Piaskowski, and Seegers 1987, 487). Note that the opportunity principle is applied by

[7] The cashflow congruence principle was first explicitly mentioned by Flesch, Piaskowski, and Sievi (1984, 363 *ff.). They* named it *Strukturkongruenz*, indicating a strict application of the interest fixation condition. In an earlier article Droste et al. (1983, 319, footnote to table 8) mentioned a procedure similar to the cashflow congruence principle, but the underlying principle was not mentioned explicitly.

comparing a customer loan with a market deposit, and a customer deposit with a market loan.[8]

The interest margin equals the difference between the yields (internal rates of return) of the customer transaction and the cashflow congruent market opportunity, in formula:

Interest margin = customer yield -/- opportunity yield

Tbe customer interest contribution is calculated by multiplying the interest margin with the volume of tbe transaction. The volume is measured by effective invested capital, according to the internal rate of return calculation. The cashflow congruence principle will be demonstrated with tbe following example:[9]

loan = 200000
nomina1 interest rate = 4 %
pay-out ratio = 90 %
amortization = 100 000 at t_1 and 100 000 at t_2

Tbis loan results in a cash outflow at origination of 180 000, and cash inflows at the end of the first and the second year of respectively 108 000, and 104 000 (see the following table).

	t_0	t_1	t_2
loan	-200 000		
discount	20 000		
net pay-out	-180 000		
interest		8000	4000
amortization		100000	100000
total cashflow	-180 000	108 000	104000

The cashflow congruence principle states that a market opportunity should be constructed with the same, but reverse future cashflows. Assume that the one-year market rate is 6 %, and the two-years market rate is 7 %. The first step is to eliminate the cash inflow at the end of tbe

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[8] In the first publications on *the Marktzinsmethode* the opportunity principle was interpreted as implying that the customer transaction could be replaced by the market opporhmity (Flechsig 1982; Flesch, Piaskowski, and Sievi 1984, 358). In that case, a customer loan is compared to a market loan and generates additional revenues, and a customer deposit is compared to a market deposit and generates cost savings. In later publications, especially with the cashflow congruent market opportunity, the opportunity principle is interpreted as that the customer transaction should be financed (in case of a customer loan) or invested (in case of a customer deposit) at the market. In this approach a customer loan is financed at the market, resulting in a cash inflow from the market that is larger than cash outflow to the customer, and a customer deposit is invested in the market, resulting in a higher cash inflow from the customer than cash outflow to the market. In both instances a cashflow surplus is realized at origination, indicating that the customer transaction has value. See also Banken (1987, 55, footnote 1).

[9] This example is used by Schierenbeck in several publications, for example in Schierenbeck (1985, 106-125; 1994: 135 ff.), and Schierenbeck and Rolfes (1988a; 1988b, 109 ff.).

second year. A payment of 104 000 at t_2 will result from borrowing 104 000 / 1.07 = 97 196.26 at origination. This market transaction will result in an interest payment at t_1 of 0.07 * 97 196.26 = 6 803.74. At t_1 108 000 should be paid, while already 6 803.74 is payable on interest on the two-year transaction. Thus at origination 101 196.26 / 1.06 = 95 468.17 should be borrowed. These two market transactions result in the following table:

	t_0	t_1	t_2
two-years	97 196.26	-6 803.74	-104 000
one-year	95 468.17	-101 196.26	
total	192 644.43	-108 ooo	-104 ooo

Refinancing the customer loan at the financial market causes a cashflow surplus at origination of 192 664.43 -/- 180 000 = 12 664.43.

The market opportunity can also be constructed by using zerobonds. A zerobond is a transaction with a cashflow at origination and a reverse cashflow at maturity. A zerobond discount factor (ZB) represents the value of one future dollar. A zerobond is traded at a discount. In the example the one-year zerobond discount factor (ZB,) is 1.06^{-1} = 0.9433962. The two-year zerobond discount factor (ZB_2) is 1.07^{-1} -/- 0.07 * 1.07^{-1} * ZB, = 0.8728619. The market opportunity can easily be determined by multiplying the future customer cashflows with the zerobond discount factors: 108 000 * ZB, + 104 000 * ZB_2 = 101 886.79 + 90 777.64 = 192 664.43."

The yield of the customer transaction is the internal rate of return of the three cashflows of -180 000, 108 000, and 104 000 amounts to 11.71767 %. The yield of the market opportunity is based on three cashflows of 192 664.43, -108 000, and -104 000, and amounts to 6.66359 %. This results in an interest margin of 5.05408 %. The interest margin is multiplied by the volume of the transaction, which is the effective invested capital.

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[10] Zerobond discount factors are synthetic zero couponbonds which are derived from the interbank rates, because in Germany zerocoupon bonds do not exist. The derivation is as follows:

$$ZB_n = (1 + r_{c,n})^{-1} * \sum_{n-1}^{i=1} ZB_i = (1 + r_{c,n})^{-1} * (1 -/- r_{c,n} * \sum_{n-1}^{i=1} ZB_i)$$

in which: $r_{c,n}$ = coupon rate on a market transaction with a maturity of n years
ZB_n and ZB_i = zerobond discount factor for the n-th or i-th year ($i < n$)

The relationship between zerocoupon rates, as they are known in the U.S. A and other countries, and zerobond discount factors is:

$$ZB_n = (1 + r_{s,n})^{-n}$$

in which: ZB, = zerobond discount factor for the n-th year
$r_{s,n}$ = spot rate (zerocoupon rate) on a zerocoupon bond with a maturity of n years

	t_0	t_1	t_2
effective capital	180 000	180 000	93 091.81
interest		21 091.81	10 908.19
amortization		86 908.19	93 091.81
cashflow	-180 000	108 000	104000

The effective invested capital during the fust year is 180 000, and during the second year 93 091.81. This results in the following interest contributions:[11]

Interest contribution year 1 = 5.05408 % * 180 000 = 9 097.34
Interest contribution year 2 = 5.05408 % * 93 091.81 = 4 704.93

Critique on cashflow congruence principle

The main arguments against the cashflow congruent market opportunity are mentioned by Schierenbeck (Schierenbeck and Rolfes 1987a, 29/30; 1987b; 1988b, 120-129):

- Although it is claimed that a cashflow congruent market opportunity eliminates reinvestment risk — because net future cashflows are zero —, Schierenbeck argues the reinvestment risk is transferred to the date of origination, because at origination a cashflow surplus exists. When this value is assigned over maturity, the reinvestment risk will be transferred to these dates again, and the elimination of reinvestment risk has been unsuccessful;[12]
- The cashflow congruent market opportunity and the customer transaction are not comparable as a result of a different invested (refinanced) capital in the market opportunity. In the example the invested capital in the customer loan amounts to 180 000, while the market opportunity has an invested capital of 192 664.43.
- The yield of two transactions are only comparable if they have the same invested capital. Since the market opportunity reflects a different investment than the customer transaction does, the interest margin cannot be determined based on the yield difference.

IV. Capital congruence

Schierenbeck (Schierenbeck and Rolfes 1987a; 1988a; 1988b) advocates another

[11] This approach *was* introduced by Sievi (C.R. Sievi: *Finanzmarhematische Kalkulation im Aktiv- und Passivgeschäft*, Bretten, 1984). referred to by Schierenbeck (Schierenbeck and Rolfes 1987a, 28; 1988b, 118-120).

[12] Although this seems a plausible argument, it can be debated if the application of the capita1 congruence principle solves this problem. As can be seen in the example that follows later in this paper, the latter approach contains future cashflow surpluses (Flesch, Piaskowski, and Sievi 1987, 191).

interpretation of *Laufzeitkongruenz*, namely capital congruence. The capital congruence principle states that the market transaction should have the same invested capital during maturity. The application of the capital congruence principle leads to the construction of a market opportunity that has equal invested capital to the customer transaction, but generates cashflow surpluses during maturity. The market opportunity should be constructed in such a way that the future cashflow surpluses reflect a constant margin in relation to effective invested capital .

The capital congruent market opportunity is constructed in the following way. Recall that the effective invested capital in the first year is 180 000, and in the second year 93 09 1.8 1, and that the one-years market interest rate is 6 %, and the two-years rate 7 %. The market opportunity consists of a one-years market transaction X and a two-years market transaction Y. At the date of origination 180 000 must be borrowed in the market, thus X plus Y must equal 180 000 (equation 1). At the end of the first year both X and Y will lead to interest payment, and X will lead to repayment of its principal (left-side equation 2). The total cashflow must equal the yield on the effective invested capital of the market opportunity (r_0 * 180 000) plus an amount equal to the effective amortization on the customer transaction (180 000 -/- 93 091.81) (right-side equation 2). At the end of the second year Y leads to interest payment and repayment of its principle (left-side equation 3). The total cashflow must equal the yield on the market opportunity plus its amortization (right-side equation 3) (Schierenbeck and Rolfes 1987a, 28; 1988a, 53; 1988b, 135-147).[13]

(1) X + Y = 180000
(2) 1.06 X + 0.07 Y = 180 000 -/- 93 091.81 + r_0 * 180 000
(3) 1.07 Y = 93 091.81 + r_0 * 93 091.81
in which r_0 represents the intemal rate of return of the market opportunity

Solving this system of equations lead to an X of 87 192.31, and a Y of 92 807.69.

X	t_0	t_1	t_2
cashflow	87 192.31		
interest		-5 231.54	
repayment		-87 192.31	

[13] Schierenbeck also presents a capita1 congruence approach, based on nomina1 invested capital (Schierenbeck and Rolfes 1988b, 132-135). After presenting the capita1 congruence approach based on effective capital, he rejects the variant with nomina1 capita1 for two reasons. In the first place, the actual cashflow at the end of the years does not comply with the customer yield, creating some inexplicable differences. Secondly, the nomina1 variant does not follow the capita1 congmence principle exactly, because the nominal, instead of the effective, invested capita1 is comparable.

Y			
cashflow	**92 807.69**		
interest		**-6 496.54**	**-6 496.54**
repayment			**-92 807.31**
total cashflow	180000	-98 920.38	-99 304.23

This market opportunity has a yield of 6.67344 **%,** and the following characteristics:

	b	t_1	t_2
effective capita1	**180000**	**180 000**	**93 091.81**
interest		**-12 012.19**	**-6 212.42**
amortization		**-86 908.19**	**-93 091.81**
cashflow	**180000**	**-98 920.38**	**-99 304.23**

Recall that the customer transaction had a yield of ll.7 1767 **%** , and a cashflow pattern of:

	b	t_1	t_2
effective capital	**180 000**	**180 000**	**93 091.81**
interest		**21 091.81**	**10 908.19**
amortization		**86 908.19**	**93 091.81**
cashflow	**-180 000**	**108 000**	**104000**

The interest margin is calculated by the customer yield minus the opportunity yield, and equals 11.71767 **% -/-** 6.67344 **%** = 5.04423 %. The interest margin is multiplied by the effective invested **capital,** which **results** in the following interest contributions:

Interest contribution year 1 = **5.04423 % * 180 000 = 9 079.62**
Interest contribution year 2 = 5.04423 % * 93 091.81 = 4 695.77

This approach is in **congruence** with the **financial** records, as the interest contributions **also** follow from **the** interest revenue **difference** and cashflow **difference.**

- **difference** between interest **revenues** of the customer transaction and the interest expenses of **the** market opportunity:

  Interest contribution year 1 = 21 091.81 -/- 12 012.19 = 9 079.62
  Interest contribution year 2 = 10 908.19 -/- 6 212.42 = 4 695.77

- **difference** between the cashflows of customer transaction and market opportunity:

  Interest contribution year 1 = 108 000 -/- 98 920.38 = 9 079.62
  Interest contribution year 2 = 104 000 -/- 99 304.23 = 4 695.77

V. The *Barwertkonzept*

In the same period as Schierenbeck developed the capital congruence principle, a specific variant of cashflow congruence was developed, usually indicated by the term *Barwertkonzept*.[14] The cashflow congruent market opportunity eliminates the future customer cashflows. However, the cashflow of the customer transaction at origination is more than completely eliminated by the market opportunity. Financing a customer loan at market rates or investing a customer deposit at market rates results in a cashflow surplus at origination. This cashflow surplus represents the present value of future interest incomes, and will be realized over the life of the transaction. In fact, not only the customer transaction is financed by the market opportunity, but also the future interest incomes (Marusev 1988, 60). 'I'herefore the cashflow surplus is allocated over the life of the customer transaction as a constant margin. A constant interest margin relative to invested capital is calculated as follows:

$$\text{Interest margin} = \frac{\text{cashflow surplus}}{\text{present value invested capital}}$$

The invested capital can be based on nominal or effective invested capital.[15] Only the effective variant is presented (Gabriak et al. 1988,788; Marusev 1988, 38; Marusev 1990a, 44; Marusev 1990b, 38):

Present value of effective capital$_{year}$ = 180 000 * ZB, = 169 811.32
Present value of effective capital$_{year}$ = 93 091.81 * ZB_2 = 81 256.30
Total present value of effective invested capital = 251 067.62

Interest margin = 12 664.43 / 251 067.32 = 5.04423 %

Interest contribution$_{year}$ = 5.04423 96 * 180 000 = 9 079.62
Interest contribution$_{year}$ = 5.04423 % * 93 091.81 = 4 695.77

The calculated interest contributions are equal to tbe interest contributions based on the capital

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[14] *Barwert* means present value. The *Barwertkonzept* refers to approaches in which a cashflow surplus at origination is seen as the discounted interest iocome of the customer transaction.

[15] The nominal approach is briefly mentioned by Droste et al. (1983, 319), and elaborated upon by Kosmider. The interest margin is calculated by dividing the cashflow surplus by the present value of nominal investe capital. The interest contribution is calculated by multiplying the interest margin with the nomina1 invested capital. The customer interest rate — the *Dispositionsbezogene Effektivzins* — is considered as a residual value, and is calculated as the difference between the opporhmity rate (yield of the cashflow congruent market opportunity) and the interest margin (based on nominal invested capital). See H.P. Kosmider: Der Dispositionsbezogene Effektivzins (DEZ) — Eine Effektivzinsmethode ohne Wiederanlageprämissen, in: L. Streitferdt, H. Hauptmann, A.W. Marusev, D. Ohse, and U. Pape. eds. *Operations Research Proceedings* 198.5. Berlin/Heidelberg, 1986, 205-215), referred to by Schierenbeck and Rolfes (1987a, 28; 1988b, 113-118).

congruent market opportunity. Schierenbeck noticed this too and concludes that the *Barwertkonzept* is easier to apply than the capital congruent market opportunity, and therefore preferable (Schierenbeck and Rolfes 1988b, 147 ff.). Since then the *Barwertkonzept* is generally accepted.

At this moment two positions are taken with respect to the assignment of interest income to periods. Both agree on the application of *the Barwertkonzept*, that is to calculate the cashflow surplus at origination based on the cashflow congruent market opportunity (using the zerobond discount factors). Within the first position the cashflow surplus is allocated over maturity based on effective invested capital (see above). The result of this approach is that the interest income of the bank of a certain period is partly determined by customer transactions from previous periods. As this part of interest income cannot be controlled it is questionable if managerial performance is measured well. Therefore the second position favors the assignment of the cashflow surplus to the period of origination (Benke, Gebauer, and Piaskowski 1991,458). They argue that the benefits of the customer transaction are completely determined at origination, and uncontrollable in later periods. Therefore these benefits should be assigned to the period of origination. This would provide a better way to assess managerial performance. The problem with this approach is that the relationship with the interest income of the bank as a whole is not visible anymore.

VI. Discussion and evaluation of the *Marktzinsmethode*

The development of *the Marktzinsmethode* was initiated by the need to find better ways to the planning and control of customer transactions. It was felt that cost-based funds transfer pricing systems did not do so, as the funds transfer rate was based on the average cost of arbitrarily categorized pools of funds, which change in composition over time. Instead of a cost-based orientation, the *Marktzinsmethode* is characterized by a market orientation in determining the funds transfer rates.

The Marktzinsmethode aims at determining the interest income of a customer transaction independently from other customer transactions. The performance is completely determined at origination, and is not influenced by other transactions, for instance changing composition of the bank's balance sheet.

The opportunity principle plays a central role in *the Murktzinsmethode.* This principle states that the interest contribution should be determined by comparison of the customer transaction to a market opportunity. In this paper we limited ourselves to fixed-rated transactions with full repayment at maturity, and with intermediate amortizations. With respect

to the second type of transactions, the selection and construction of a market opportunity was discussed. Two principles that are used to construct a market opportunity were presented: cashflow congruence and capital congruence. Several different approaches to the application of these principles were presented. It was demonstrated that the *Barwertkonzept*, which results from the cashflow congruence principle, will lead to the same results as the (effective) capital congruent market opportunity, if the cashflow surplus of the customer transaction is allocated over maturity based on effective invested capital. This approach will lead to consistent results with respect to yield difference, interest revenue difference and cashflow difference.

Despite the advances made in the development of the *Marktzinsmethode* some issues need to be clarified. In the first place, as soon as the cashflow pattern is not known in advance, as is the case with variable rated transactions, demand deposits, premature redemption, etc., the approach presented in this paper needs adjustment and elaboration. The same is true for specific constraints, like reserve and solvability requirements.

Further, it is unclear if the opportunity principle should be applied to determine alternative sources or uses of funds — in which a customer transaction could be replaced by a market transaction, as was suggested in early publications on the *Marktzinsmethode* —, or to determine refinancing or reinvestment market transactions — as seems to be common in later publications. This will be important as market lending and borrowing rates differ, and as banks are in the market as borrowers or lenders.

A third problem concerns the interpretation of the mismatch contribution. When the *Marktzinsmethode* was first developed the mismatch contribution was calculated as the difference between net interest income and the total customer contribution. Since 1990 a lot of effort has been invested in explaining the composition and the sources of the mismatch contribution, but this debate is stil1 going on.

Despite the complexity of the *Marktzinsmethode*, and some unclarified issues, it seems to have acquired considerable popularity in practice. Kodlin (1992) reports that 46 percent of the 201 surveyed financial institutions already use the *Marktzinsmethode*, and that another 40 percent is planning to do so in the near future. He also indicates that 95 percent of the financial institutions the opportunity rate is registered for transactions, and in 85 percent for branches, customers and products. Kodlin does not report on the sophistication of the system used, for instance on the treatment of variable rated transactions, etc. But the fact that a substantial share of the articles and ***books*** on the *Marktzinsmethode* is written by practitioners allows the inference that some advanced variants are used in practice.

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