Concepts in Best Practice: Transfer Pricing Customer Accounts

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1 Introduction

This white paper discusses the fundamental concepts of transfer pricing (FTP) and outlines industry best practices, applicable to any firm attempting to quantify a cost or worth of customer funds. The content addresses the different flavors of risk and their application to FTP pricing concepts. Note that this synopsis focuses on transfer pricing customer instruments, not other balance sheet accounts or off balance sheet positions, and is limited in kind.

2 Interest Rate Risk

2.1 Definition

The risk of fluctuations in interest rates over time for a given term structure. This risk is transferred to a central treasury unit via FTP for hedging; the transfer of interest rate risk from a booking department to the treasury unit is the primary function of FTP. The total balance of the Treasury account represents the interest rate risk exposure of the bank's portfolio. Similarly, the difference between the weighted average funds credit rate and the weighted average funds charge rate represents the interest rate risk spread for the bank. The risk spread exists because of mismatches in maturities, repricing, and cash flow characteristics among the assets and liabilities. Said differently, the rate risk spread is the return to the Treasury unit for managing interest rate risk (minus hedging costs). Treasury's income or loss, called mismatch, may reverse itself across periods as a result of balance sheet positions taken and future interest rate swings.

Rates are assigned to booking departments based on a matched maturity principle, where the rate reflects the maturity and liquidity characteristics at the time the instrument was booked. By attaching a transfer price to an asset/liability at the time it is booked based on its expected term, the booking department effectively locks in a spread for the life of the instrument and transfers all interest rate risk to the Treasury unit. The actual return to the Treasury unit will fluctuate with interest rate movements, unless hedged appropriately.

The correct transfer rate to assign to an asset or liability should reflect the bank's marginal cost (benefit) to borrow (invest) at that maturity. It should be noted that interest rate risk assignment has an embedded liquidity component in the slope of the assigned yield curve. The normal upward slope of a yield curve reflects the added cost (benefit) to borrow (invest) as the term increases.

2.2 Application for FTP Processing

Best practice for transfer pricing interest rate risk depends on the product type, and is summarized here, borrowing in part from a Funds Transfer Pricing Position Paper, authored by Sally McNulty.

2.2.1 Yield Curve Source Rates and Interpolation Methods

Either a spot rate, or a rate interpolated between two spot rates, is necessary to derive a transfer price. The defined spot rates should approximate the marginal cost or benefit of funds under a typical environment (not under financial distress). The appropriate spot market issues to use across a yield curve depend on the terms in question. The "Best Practice" for spot rate to term association:

Federal Funds (overnight lending) Effective Rate	1 day
Interbank Bid/Ask Rates	30 Days – 1 Year
Treasury Curve plus interest rate swap spread	2 Years – 10 Years

For those terms that fall between defined spot rates, a method must be chosen to interpolate rates between the range. Linear, as well as cubic, methods can be used; the appropriate method to employ depends on the aggressiveness of the bank's pricing policy, as well as the convexity of the current interest rate environment. The more convex, or curvier, the interest term structure, the more appropriate does a cubic method become.

2.2.2 Fixed Rate Products

Fixed rate products are generally agreed to be transfer priced according to their cash flow characteristics, using term measures such as average life or duration, or weighted average cash flow matching using strip funding. These methods take into account the amortization schedule effects on the present value of cash flow payments, and, in the case of strip funding, weight the transfer price in each period by the time weighted average of the periodic cash flow.

Theoretically, strip funding is the most accurate measure of transfer pricing, since it uses cash flows to weight the transfer price in each cash flow period, resulting in a time-weighted blended rate. Conversely, term measures such as duration approximate a single term measure based on time weighted cash flows and derive a single transfer price at that term. These term measures can take into account such behavioral factors as prepayment speeds according to projected interest rate environments.

Strip funding attempts to approximate the Internal Rate of Return necessary to make the cumulative present value of all cash flows equal to the amount borrowed, taking into account amortization schedule and external interest. This approximation uses the following formula:

$$r_o = ((CF_1 * T_1) / S)\, r_1 + ((CF_2 * T_2) / S)\, r_2 + \ldots.. ((CF_n * T_n) / S)\, r_n$$

$$S = \Sigma(CF_1 * T_1 + \ldots. CF_n * T_n)$$

CF_n: Future Cash Flow at Time n
T_n: FTP Term (measured in days) at time n
r_n: Transfer Price Rate at time n
n: Number of Periods forward in time

It should be noted, however, that strip funding does not discount the cash flows in each period when applying a time weight. The CF variable above is the future, not the present, value of the cashflow. Thus, the bigger the cashflow and the further away in time it occurs, the larger the weight to the transfer price in that period. The formula reflects the theory that the transfer price should be weighted by the amount of time it is in effect (time weight) and the proportion of the total risk transfer it represents (future cash flow value).

A question still remains outstanding on the appropriate 'r' variable value to apply to the above formula, i.e., the best approach for applying a transfer rate to instruments with periodic coupons. While it is agreed that NPV analysis should use zero coupon yields to determine a present value of each cash flow, it remains unclear if the zero rate reflects the marginal cost of funds. Said differently, we have yet to confirm if best practice calls for pricing FTP with

quoted spot rates at YTM or their zero coupon equivalent (rate with no interest payments, principal at a discount to par). Logic suggests use of the actual spot rate, since it is assumed that the treasury unit will receive periodic interest payments at the quoted cost of funds rate through the term of funding.

Further to the issue of Treasury managing periodic coupons, at the long end of the term curve (terms > 1 year), quoted swap spot rates are used to price fixed products. The Swap curve is considered the least risky curve, since it approximates the cost of swapping fixed coupon payments for variable coupon payments. Doing so effectively hedges long term fixed assets to short term variable liabilities, locking in spread, and eliminating interest rate risk.

For modeling only short term (< 1 year) fixed rate deposits, one can take a simplified approach. Given their short-term nature and back end interest payments, a non-cashflow term method, such as term to maturity, is acceptable. All other fixed rate products are either match funded or modeled on a cash flow basis.

2.2.3 Variable Rate Products

Best practice for term estimation on variable rate products is to use a term value equivalent to the reprice frequency, or term until next reprice event or date. In either case, the term should represent the period that the instrument's stated interest rate remains in effect. For each date that the instrument reprices, it should receive a new transfer rate effective on that date.

It should be noted that this term practice overlooks liquidity risk, which must be modeled as a distinct risk measure for variable rate products [see Liquidity Risk section].

2.2.4 Loans with Intent to Sell

Some loans are originated with the intent to sell to another financial institution, which usually will securitize a basket of loans, and must be transfer priced with a term according to their expected holding period. These loans should be pooled together and priced as a unit. This practice recognizes the matched maturity concept, since the Treasury unit will fund them based on their anticipated time on the balance sheet.

2.2.5 Indeterminate Maturity Products

For those assets and liabilities on the balance sheet which do not have a specific contractual maturity, it is best practice to segment the balances into "core" holdings and holdings that fluctuate, then pool the total balances for these segments. In this case, "core" balances represent the portion of the total balance that remains stable through time and can be credited or funded on a long-term basis. Non-core funds, due to volatility in account balance, are temporary in nature and cannot be utilized on a long-term basis.

Regression analysis must be performed to determine the percentage of balance that belongs in the core vs. non-core segments, and the average life of the balance in each segment. Analysis must also be executed across customer segments to estimate the behavioral differences in retail, corporate and public accounts.

Once the balances are segmented, it is best practice to apply a rate at the expected life term for the segment, averaged over that term, e.g., 5 year moving average of the 5 year rate. The rate

should be applied to the pool of instruments for the segment as of the last day of the reporting period. Doing so simplifies processing, in that a single rate is applied to a pool of instruments, yet the moving average calculation accounts for the fact that balances have existed on the balance sheet over the average life period.

3 Prepayment Risk

3.1 Definition

Prepayment risk estimates the cost of reinvestment risk should a customer prepay on a fixed rate commitment. This cost is estimated as the differential between the present value of interest payments on the original loan and the reinvestment interest rate return for the remaining term to maturity. This cost is assessed at time of prepayment and is ultimately intended to dissuade branch managers from issuing loans with embedded prepayment options.

3.2 Application for FTP Processing

Some foreign markets, such as the Danish loan market, differ from that in the US in that banks revalue, or mark to market, loans based on current interest rates. Thus, if interest rates decrease, the customer would need to repay the full market value of the loan, which would eclipse the outstanding principal, in order to exit the loan agreement. The going interest rate becomes the discount factor on the loan, making the bank indifferent to prepayment. In this way, reinvestment risk is effectively passed to the customer, and no prepayment cost is recorded. Confirmation required as to the totality of this practice, e.g., mortgage market vs. fixed corporate loans, which could translate well to segmentation of prepayment risk by product.

Normally, in markets such as the US, it is necessary to run a cash flow estimate of the "opportunity cost" of the prepayment, and then pass this cost to the booking department and credit Treasury. Further, the charge can be recognized fully in the period of prepayment or amortized over the remaining contractual term prior to assumed prepayment.

4 Liquidity Risk

4.1 Definition

Liquidity risk is generally defined as the risk of not having enough liquid capital to make short term liability payments. This risk is realized in the form of term mismatch between asset and liability funding, and can take several forms. The first form deals with short term variable liabilities funding long term fixed assets, which introduces margin risk in an increasing interest rate environment, as well as the potential for those liabilities to no longer be available in the marketplace, as was encountered in the Global Financial Crisis of 2008. The other form addresses risk of liquidity becoming locked and unavailable to service liability withdrawals for the term of the asset. As the term of funding increases, normally so does the cost of funding, reflecting the increased liquidity cost. Similarly, as the term of investment increases, so should the transfer credit, reflecting the increased liquidity benefit.

For credit lines, an additional liquidity concept is applicable, in that capital must be available to cover the total committed line, not just the drawn down balance. The portion of capital to cover the undrawn balance (potential draw down) must be invested in securities of short maturities. To compensate for the fact that the return on these short maturity securities has an opportunity cost (compared to a potential investment at a longer maturity), a liquidity adjustment is necessary.

The liquidity concept is normally reflected in an upward sloping yield curve: As the term of funding increases, so does the opportunity cost for servicing liabilities. The true "liquidity spread" can be derived from the difference between the borrowing and lending costs at a given maturity. Further, total liquidity cost is embedded in the risk free borrowing rate (Treasury or equivalent) at a given maturity.

Liquidity risk is also affected by size, both within and across markets. Within a market, the cost to buy a good is not the same when traded at high volumes vs. when traded at low volumes and is reflected in the bid/ask spread; the spread is comparatively lower as the block trade size increases. Liquidity risk is also reflected in the size of the market for a given security. Liquidity risk is thus different across markets, and can be impacted by market inefficiencies and monopoly/oligopoly environments. For instance, if a bank is a dominant player in the deposit market for a given currency, yet a lot of its available liquidity is not offered in the market, it will have an effect on intra-day curves and currency bid rates for certain maturities. On the other hand, liquidity size risk is not necessarily impacted by market inefficiencies, and may simply reflect a lower supply/demand profile. For instance, liquidity for DKK currency is much lower than that for USD currency, which again should be reflected in a wider quoted bid/ask spread for DKK.

4.2 Application for FTP Processing

The first form of liquidity risk, variable/fixed term mismatch, is a treasury hedging function and is transferred from the business unit to the treasury through transfer pricing. The cost of the hedge to swap long-term fixed for short-term variable payments is passed to the business unit through pricing against the swap yield curve.

The second form of liquidity risk, term lock, is fully reflected in the risk free rate of borrowing or lending at the full term of the instrument. However, for those assets/liabilities which reprice on a regular basis, and thus are priced only at the term to the next reprice date, the transfer price does not reflect the full liquidity risk/benefit. Therefore, for market and administrative rate products, which reprice regularly, the applied transfer price should include a liquidity adjustment cost/benefit. This liquidity cost/benefit in any given period should reflect the rate spread between funding/investing at the remaining term to maturity and the reprice period. In order to simplify this calculation, many banks approximate the term lock risk with a fixed basis point adjustment based on original term to maturity of the instrument. However, this method tends to overestimate liquidity risk/benefit as the instrument matures.

Liquidity cost on credit lines is best approximated as the spread between applicable short and long term investing, with the long end derived from the remaining term of the line. Recommendation white papers based on actuarial studies, such as those produced by Oliver Wyman & Co., suggest that the opportunity cost adjustment be best approximated through a straight basis point adjustment. This basis point approximation takes into account the likely % of draw down against the undrawn balance, as well as the spread between long and short term investing.

In theory, a transfer pricing adjustment could be assessed based on original balance size (within market liquidity) and relative liquidity of the funding source and currency type (across market liquidity). Regarding the latter, currency liquidity should be reflected in a currency specific yield curve. Empirical market evidence for both types of risk is needed in order to quantify the tiers of any potential adjustment.

5 Credit Risk

5.1 Definition

Credit risk must be logically broken into two components: 1) default risk of the bank's customers in the asset portfolio and 2) the credit rating of the bank and its affect on borrowing costs.

Customer credit risk should be approximated through a capital allocation, with attendant capital benefit and cost, as a buffer for unexpected loss and a separate charge for expected loss.

Credit risk for the bank is approximated through the chosen swap borrowing curve, e.g., the swap rates for AA credit rating should be higher than equivalent maturity AAA swap rates. The swap curve is derived from the spread between corporate debt at a given credit rating and the risk free rate (Treasury or equivalent). The swap spread thus equals the cost of the bank's credit risk. In this way, the rates from the swap curve reflect the credit worthiness of the intermediary borrower (the bank), not the credit risk of the final customer.

5.2 Application for FTP processing

Concerning customer credit risk, the Risk Weighted Capital engines calculate the expected loss cost and allocate economic capital to assets as a buffer for unexpected losses. What is lacking is a cost and benefit computation for that allocated capital, which can be computed through an FTP software program. The capital rate is derived through a yield curve lookup against a defined cost of funds curve with an assumed term of capital.

Regarding the bank's credit risk, often the true market price for funds is a basis points adjustment lower or higher than the published swap rate for the bank's credit rating. This occurs because of the small number of credit ratings and the variability of true credit worthiness within a classification, as well as the bank's degree of market activity and access to specific funding sources. For instance, a AA rating can actually underestimate the credit quality of a given financial institution as a debtor and thus overestimate the true funding cost in the open market. A large contributing factor to this disparity is often the thin trading market for currency specific corporate debt. A credit risk adjustment to the swap curve thus may be needed to economically approximate a firm's true cost to procure funds. Analysis of empirical evidence, such as trend analysis on the spread of prices received in the market to stated swap curve, is required to approximate the magnitude of the credit adjustment.

Further, best practice separates the bank's credit risk from that attributed to the customer. The bank bears the full credit risk of the customer in that the bank cannot "pass through" the cost of a customer default to its creditor (the source of funds for the bank). Credit risk thus deteriorates net instrument contribution twice: Once for the bank's credit risk via the cost of the spread between the risk free rate and the bank's marginal cost of funds (FTP); a second time in the cost of expected loss and the spread between cost of equity and capital benefit (RWC).

6 Conclusion

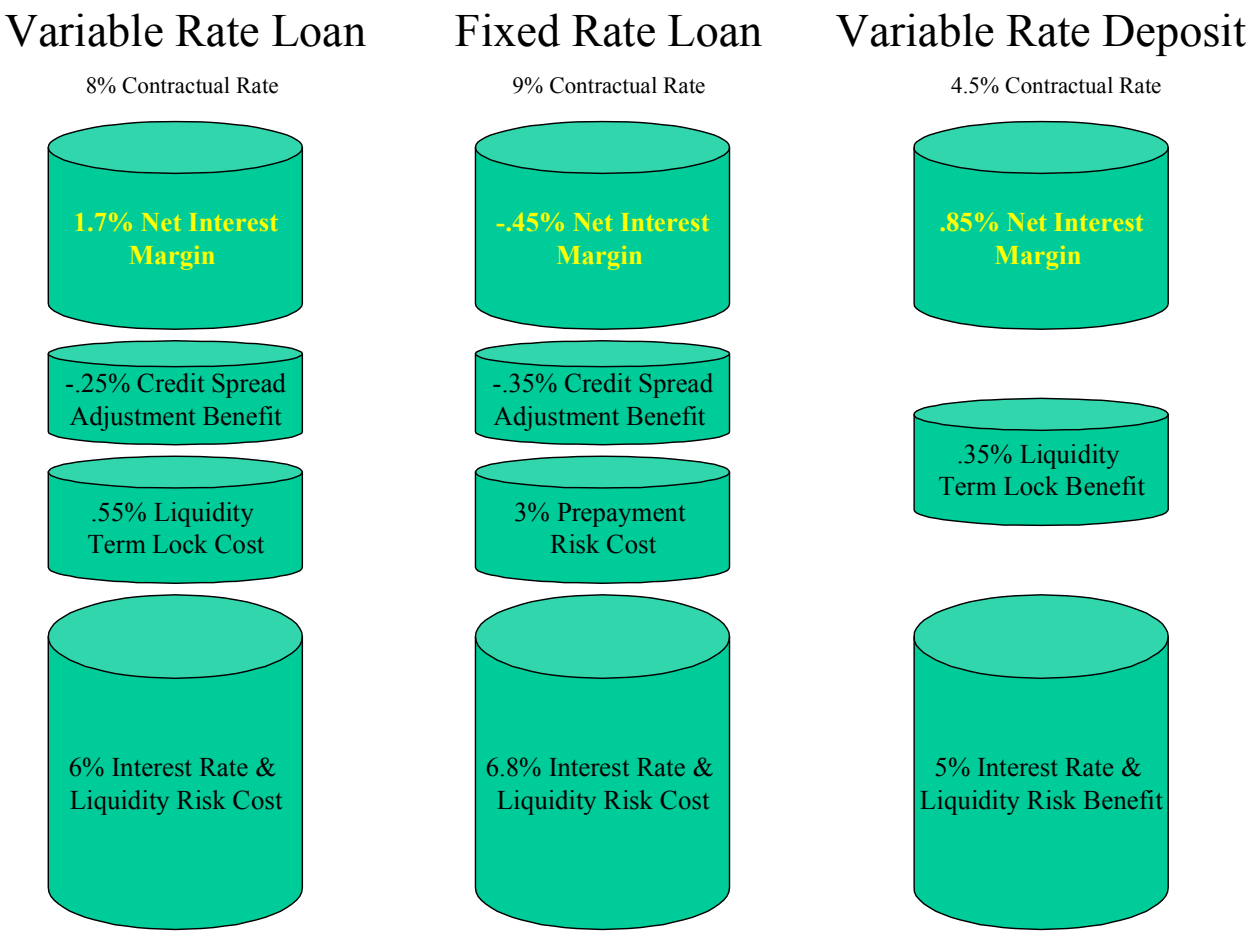
The objective of transfer pricing is to decompose risk into those components that can be transferred to a central Treasury unit for management, then approximate a cost or benefit for each component. To this end, any facility which calculates the risk costs should be able to report each component individually. A robust dimensional framework should accompany the risk calculations, enabling profitability views by any combination of the attendant dimensions.

Additional calculations can create a framework for analysis beyond the transfer priced net interest margin, such as Risk Adjusted Return on Capital and Annual Value Added (AVA). These calculations include Cost to Service, Expected Loss, Capital Benefit, and Cost of Equity/Capital. The inclusion of these calculations at a dimensional level would provide a full picture of "required" rate of return. However, only Capital Benefit (short term benefit of allocated capital) and Cost of Equity (long term cost of allocated capital) fall under the realm of transfer pricing calculations, and neither impact net interest margin.

In this paper, we have discussed four major categories of risk, and the recognized best practices used to quantify the cost/benefit of the risk to a Treasury unit. These risk categories are:

- Interest Rate
- Prepayment
- Liquidity
- Credit

A transfer pricing system should thus be able to calculate Net Interest Margin, with visibility to each risk component. Represented visually:



The example above displays profitability by Product, but a dimensional model including Customer, Department, Time, etc. would allow even more robust analysis. It is the focus of an FTP implementation to build a framework that can calculate and report transfer priced profitability in this fashion.

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