

Fund transfer pricing for deposits and loans, foundation and advanced¹

Jean Dermine

Professor of Banking and Finance, Chair Finance Area, INSEAD

Abstract

Fund transfer pricing (FTP) is fundamental for evaluating the profitability of deposits and loans. Following the global banking crisis, this paper seeks to draw attention to five issues that have been previously ignored: rationing on the interbank market, the creation of a Basel III contingency liquidity buffer, the necessity to adjust FTP to the credit riskiness of specific assets of the bank, the need to include a liquidity premium in the case of long-term funding, and finally, the choice of a consistent methodology to incorporate the credit spread on the bank's own debt due to the perceived risk of bank default.

1 This paper significantly expands on the first paper on fund transfer pricing [Dermine (2012)].

Introduction

Fund transfer pricing (FTP) is used by bankers to evaluate the profitability of deposits and loans and for pricing. It is used by academics and antitrust authorities to evaluate the degree of competition in banking markets. The challenge, as far as on-balance sheet banking is concerned, is as follows. When one evaluates the profitability of deposits, the costs are known, namely the interest paid on deposits and the operating expenses associated with deposits, such as employee time and IT. However, determining the return on deposits is more problematic because deposits are used to finance various types of assets: consumer loans, corporate loans, interbank assets, bonds, and fixed assets. Revenue – known as the fund transfer price – must be determined to remunerate deposits. For loans, the problem is symmetrical: one knows the return on loans, that is, the interest income net of expected bad debt expense, but not its funding costs. The reason is that banks use several sources of funds to finance assets: demand deposits, savings deposits, time deposits, corporate deposits, interbank deposits, subordinated debt, and equity. Again, there will be a need for a specific fund transfer price to evaluate the cost of funding loans. Appropriate identification of the FTP is fundamental for pricing commercial products, performance evaluation, bank strategy design, and assessment of the level of competition in banking markets.

The *foundation* approach, used throughout the banking world, is presented below. It covers two cases: products with fixed and undefined maturities. We argue that, as a result of the global financial crisis, attention should be given to five issues that have previously been ignored: rationing on the interbank market, the creation of a Basel III contingency liquidity buffer, the necessity to adjust fund transfer price to the credit riskiness of specific assets of the bank, the need to include a liquidity premium in the case of long-term funding, and finally, the choice of a consistent methodology to incorporate the credit spread on the bank's own debt due to the perceived risk of bank default. We conclude that an *advanced* approach to FTP must be adopted by banks.

Fund transfer pricing, foundation approach

The foundation approach to FTP is presented first. It includes two cases: deposits or loans with fixed maturity and products with undefined maturity.

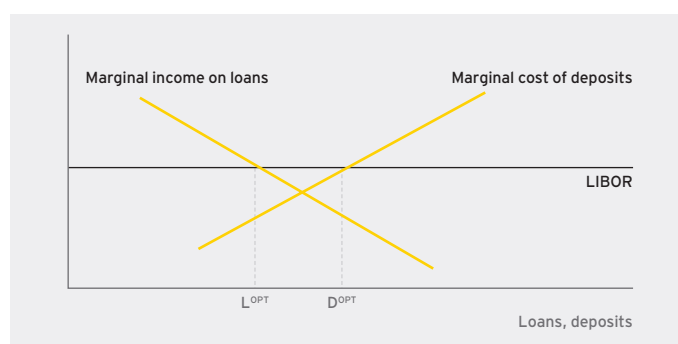


Figure 1 - The separation theorem

Foundation approach: products with fixed maturity (FTP1)

The foundation approach to FTP is represented in Figure 1. The horizontal line represents the market rate, that is, the interest rate observed on the interbank market (LIBOR).² The line is horizontal as the interest rate is set on the major international markets and is independent of the volume of transactions initiated by the bank. The two other lines represent the marginal income on loans and the marginal cost of deposits. As a bank wishes to increase its loan portfolio, the expected income from an additional dollar of loan – the marginal or incremental income – will go down because the bank needs to reduce the interest rate to attract the additional dollar of loan, or because the bank accepts a loan of lower quality. Similarly, the cost of collecting an additional dollar of deposits – the marginal or incremental cost of deposits – will go up because the bank needs to raise the deposit rate to attract the additional dollar of deposits or because the bank needs to open more expensive branches in remote areas. In Figure 1, the optimal volume of deposits, D^{OPT} , is reached when the marginal cost of deposits is equal to the interbank market rate. One would not want to go beyond D^{OPT} because the incremental cost of deposits would be higher than the return earned on the money markets.³ Similarly, the optimal volume of loans, L^{OPT} , is reached when the marginal revenue from loans is equal to the marginal investment return, the market rate. One would not want to increase the loan portfolio beyond L^{OPT} because the incremental income on the new loan would be lower than the return available on the money markets. The maturity of the market rate used for FTP

² In some countries with illiquid interbank markets, the relevant market rate is the interest rate on government bonds.

³ We ignore reserve requirements with Central Bank which reduce the revenue earned on deposits.

should correspond to the maturity of the fixed-term product.⁴ For short maturities of up to one year, one frequently uses the interbank market rates, and for longer fixed-rate maturities, one uses the swap rates.⁵ Note that there is a *separation* between the lending and funding decisions. The separation theorem states that loans and deposits must be priced with reference to the market rate and these decisions are independent of one another. The difference between the optimal volumes of deposits and loans ($D^{OPT} - L^{OPT}$) is the net position in treasury assets, bonds or interbank assets. In Figure 1, it is positive, with deposits exceeding the volume of loans. The bank is a net lender in the money market. But it could be negative when the bank is a net borrower, as illustrated in Figure 2. In this case, the difference between the volume of loans and deposits ($L^{OPT} - D^{OPT}$) must be funded in the money markets.

Foundation approach: products with undefined maturity (FTP2)

In the foundation approach to FTP, the relevant maturity for the marginal return is the maturity of the deposit or loan. A two-year deposit should be priced against the two-year matched maturity market rate. There are several well-known cases, such as demand or savings deposits, for which the *contractual* maturity (very short, as withdrawable on demand) is different from the effective *economic* maturity. Indeed, many deposits are fairly sticky, with a longer effective maturity. An *ad hoc* method is to divide the stock of deposits into permanent core deposits and volatile deposits. The effective maturity is a weighted average of the two maturities, long and short. As shown below, dynamic considerations have to be taken into account to reflect the impact of the current volume of deposits on future volumes and interest margins.

Consider the case where the volume of deposits in Year 2, $D_2(\cdot)$, is a function of not only the deposit rate paid in that period, d_2 , but also of the volume of deposits collected in Year 1, D_1 .

4 Matching maturities not only meets intuition in the search for a relevant opportunity cost, it also protects the commercial units against interest rate (or currency) fluctuations. Interest rate (or currency) mismatches are transferred to the ALM department which is in charge of managing these sources of risk [Dermine (2009)].

5 The swap rate gives the long-term cost of a roll-over of short-term interbank funding that is hedged with a swap. This is likely to differ from the actual cost of funding the long-term asset with a long-term debt that would include a liquidity or credit spread. The use of a swap rate is appropriate when the bank performs the traditional function of maturity transformation, funding long-term assets with short-term debt. The case of maturity matching – long-term assets funded with long-term debt – is analyzed separately later.

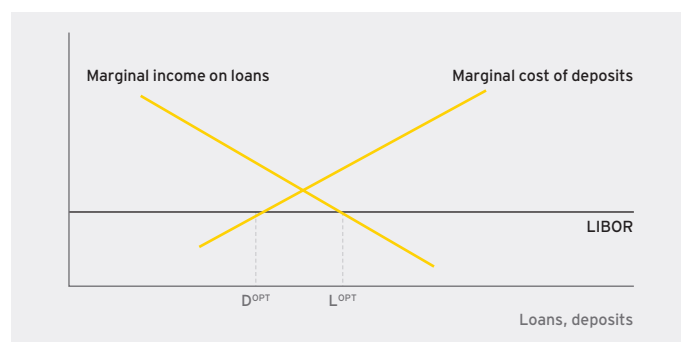


Figure 2 - The Separation theorem

Given the dynamic consideration, b_1 and b_2 denoting the market rates in Year 1 and Year 2, the present value of future profits over two years, evaluated at end of Year 1 is equal to:

$$\text{Present Value of Profits} = [(b_1 - d_1) \times D_1(d_1)] + \left[\frac{(b_2 - d_2) \times D_2(d_2, D_1)}{1 + b_2} \right]$$

The marginal income on one dollar of deposits⁶ collected in Year 1 is equal to:

$$\begin{aligned} \text{Marginal Income} &= (b_1 - d_1) + \frac{(b_2 - d_2)}{1 + b_2} \times \frac{\partial D_2}{\partial D_1} \\ &= \left[b_1 + \frac{(b_2 - d_2) \times \alpha}{1 + b_2} \right] - d_1 \end{aligned}$$

$$\text{With } \alpha = \text{persistence factor} = \frac{\partial D_2}{\partial D_1}$$

The marginal income on one dollar of deposits collected this year includes two parts: the market rate in Year 1 earned on this dollar of deposits and the present value of the profit in Year 2 resulting from the persistence of that additional unit of deposit. The existence of a lag in the deposit or loan function resulting from loyalty of clients or the rigidity of interest rate (due to marketing reason and cost of changing the pricing menu) forces one to analyze the FTP over multiple periods.⁷

It should be noted that the choice of a fund transfer price in a multi-period setting applies not only to demand or savings deposits

6 Note that we ignore the cost of the action needed to attract the extra dollar of deposits, such as additional marketing expenses or increase of the deposit interest rate.

7 As shown formally in Dermine (2009), it is only in the case of a fixed rate on deposit ($d_1 = d_2$) and a persistence factor of $\alpha = 1$ that the fund transfer price is equal to a two-year maturity market rate.

[Hutchison and Pennachi (1996)] but also to other products, such as consumer or credit card loans, known for market-share stickiness and rigidity of interest rates [Jarrow and Van Deventer (1998)].

The use of a matched-maturity market rate forms the core of the foundation approach to FTP. In the case of dynamic considerations, such as lag in the supply/demand function or interest rate rigidity, one must use a dynamic multi-period approach. The foundation approach has been used extensively around the world.

During the economic expansion observed in many countries from 2003 to 2007, banks expanded their loan books massively, relying on market funding when the loan books exceeded the deposit base. The loan-to-deposit ratio exceeded 100% in several countries, including the U.K., Greece, Portugal, Spain, Brazil, Peru, and Vietnam. The underlying assumption was that market-based funding, such as interbank deposits or certificates of deposit (CDs), would always be available to finance their illiquid loans. The global financial crisis, which started in July 2007, proved this assumption wrong. The interbank markets froze after Bear Stearns' announcement that it had to refinance two of its structured investment vehicles. Banks rediscovered liquidity risk and the need to manage and price this source of risk. This has led to a review of the FTP methodology.

Fund transfer pricing, advanced approach

The global financial crisis has drawn attention to the fact that an *advanced fund transfer pricing* system is needed in specific circumstances. Five cases are analyzed below: rationing on the interbank market, the need to build up a Basel III contingency liquidity buffer, the need to adjust to the credit-riskiness of specific assets of the bank, the liquidity premium on the term structure of interest rates in the case of long-term funding, and the need to take into account the bank's credit spread when its default risk is not trivial.

FTP and rationing on the interbank market (FTP3)

In Figure 2, the optimal volume of loans is larger than deposits. This implies net borrowing on the interbank market. The recent crisis has raised our awareness of the fact that interbank funding is volatile. In countries facing a sovereign debt crisis, such as Greece, Ireland and Portugal, local banks have been shut out of the international money markets. In such a situation, loans

cannot exceed the volume of deposits.⁸ It must be noted that, although rationing on the interbank market is quite novel in OECD countries, it has frequently been observed in emerging markets with less developed liquid interbank markets.

In Figure 3, the starting position is identical to that of Figure 2. If deposits and loans are chosen with reference to the market rate, the optimal volume of loans exceeds that of deposits, the shortage of funds being met on the interbank market. As this will not be feasible in a situation in which no lender is willing to provide funds at a reasonable market rate, the bank needs to increase the volume of its deposits and/or reduce the volumes of its loans. The optimal point is achieved where the marginal income on loans line intersects with the marginal cost of deposits line. At this point, the volume of loans matches the volume of deposits and there is no reason to expand further deposits as the marginal cost would exceed the marginal income on loans. As shown in Figure 3, the optimal portfolio of loans and deposits can be achieved by artificially raising the fund transfer price, the "market rate" straight line, thus creating the right internal incentives to ensure a larger volume of deposits and a lower volume of loans.⁹

In a situation of rationing on the interbank market, which is closed to the bank, or in a situation of a binding loan-to-deposit ratio, a relevant fund transfer price can be found by *grossing up* the market rate. It creates internal incentives to raise additional deposits and reduce the volume of loans, ensuring the desired equality of loans and deposits. As, in reality, the location of the deposit and loan marginal lines are not known with certainty, some experimentation will be needed. The setting of a higher fund transfer price meets the intuition of better remunerating the collection of stable deposits, and charging a higher funding cost for illiquid bank loans. It preserves the logic of maximization of profit on loans evaluated against an adjusted fund transfer price, and the maximization of profit on deposits. An alternative to raising the FTP would be to directly set deposit and loan volume targets at the level where the volume of deposits is equal to the loans.

In this first advanced case, there was rationing on the interbank market, that is, banks cannot fund themselves in this market, often

⁸ If central banks provide liquidity in the short-term adjustment period, they will require rapid self-sufficiency in funding the assets of the bank.

⁹ An alternative financial strategy is to sell or securitize assets to reduce the funding deficit.

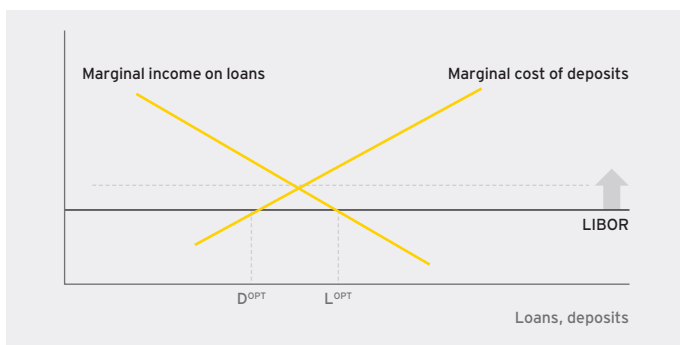


Figure 3 - The separation theorem

due to a fear of insolvency of the bank or sovereign risk resulting from a fear of insolvency of a country. In the second case, analyzed below, banks have access to an interbank market, but they must fund a Basel III *contingency liquidity buffer*.

FTP and Basel III contingency liquidity buffer (FTP4)

Consider the following balance sheet. At the initial stage, a loan portfolio (L) is funded partly by deposits (D) and interbank funding (I). The interest rate on interbank deposits is denoted by i .

Loans L	Deposits D Interbank deposits I (i)
Liquid bonds B (b)	Long-term debt F (f)

During the global liquidity crisis, that started in July 2007, the interbank market dried up and banks turned to governments or central banks to obtain liquidity. For example, in 2010, 18% of funding of Greek banks was obtained from the European Central Bank [Financial Stability Review (2010)]. As a result, bank regulators and the Basel Committee (2011) decided to put in place a new regulation to ensure self-sufficiency of liquidity in future crises, whereby banks must create a portfolio of contingency liquid bonds (B), funded with long-term funds (F, with $B = F$).¹⁰ The return on liquid bonds and the cost of long-

¹⁰ The report of the Financial Services Authority into the failure of Royal Bank of Scotland [FSA (2011, p. 106)] shows that the FSA liquidity rules did not cover the firm's dependence on non-sterling denominated wholesale funding nor did they capture off-balance sheet liquidity risk, for example as a result of committed liquidity facilities. For sterling deposits, banks had to be able to meet a five-day stress scenario. A comment on a survey by the Financial Stability Institute [Grant (2011, p. 6)] states that: "Most banks included in the survey lacked a Liquidity Transfer Pricing policy."

term funding are denoted by b and f . The objective is that the banks can sell the bonds (or use them as collateral) in the event that the interbank market dries up.

It is assumed that the cost of long-term funding (f) is higher than the return on liquid assets (b). The higher cost of funding is not related to the risk of bank default, a case analyzed explicitly below, but is caused by a liquidity premium. Corporate finance theorists [Holmström and Tirole (2011)] attribute the existence of a liquidity premium to imperfections in the capital markets and an absence of complete pledgeability of a firm's future income. As a result, bondholders might be afraid that the bank's insiders (management or shareholders) take actions that are detrimental to bond holders. An example is asset substitution, with an increase in the riskiness of bank's assets after the terms of the bond have been fixed.¹¹ Another related explanation of a liquidity spread is that investors are concerned that liquidity in the corporate bond markets, the ability to trade at reasonable cost in the future, might disappear.

The contingency portfolio of liquid bonds must be able to meet a deposit outflow of $\alpha\%$ of stable deposits D and $\beta\%$ of more volatile interbank deposits I (with $\beta > \alpha$). As long-term funding is expensive, the cost of the liquidity buffer, the difference between the cost of long-term funding and the return on contingent liquidity assets, is equal to: $(f - b) \times B$.

Assume that $B = F = (\alpha \times \text{Deposits}) + (\beta \times \text{Interbank deposits})$.

As shown in the appendix, banks need two fund transfer prices, one for loans and one for deposits. They take into account not only the impact of collecting deposits and loans on the interbank position, but also the impact on the cost of the contingency liquidity buffer:

$$\begin{aligned} \text{Loan - FTP} &= \text{marginal cost of loan} \\ &= i + [\beta \times (f - b)] = \text{interbank rate} + \text{liquidity cost} \end{aligned}$$

$$\begin{aligned} \text{Deposit - FTP} &= \text{marginal income on deposit} \\ &= i + [(\beta - \alpha) \times (f - b)] = \text{interbank rate} + \text{liquidity revenue.} \end{aligned}$$

The intuition is as follows. In the first step, an increase of one dollar in the loan portfolio requires additional interbank funding as

¹¹ One way to reduce the liquidity premium on long-term funding is to issue covered bonds, bonds collateralized by safe assets.

there is a lack of deposits. The first part of the fund transfer price is the usual interbank rate. But, in a second step, the increase in interbank funding requires, due to the new liquidity regulation, an increase in the costly contingency buffer. This is the added liquidity cost [$\beta \times (f - b)$], the cost of carrying a liquidity cushion. Applying similar reasoning, an increase in stable deposits allows the bank to reduce interbank funding. The first part of the fund transfer price of deposits is, thus, the usual interbank rate. But, due to the contingency liquidity regulation, an increase in stable funding accompanied by a decrease in volatile interbank funding leads to a reduced contingency liquidity buffer ($\beta - \alpha$) and additional revenue (the reduced cost of the liquidity buffer [$(\beta - \alpha) \times (f - b)$]) is added to the fund transfer price for deposits. It should be noted that a higher fund transfer price for loans will lead to higher lending rates. This is justified in order to correctly price the cost of liquidity risk.

Liquidity risk has drawn attention to the need to adjust fund transfer pricing to take into account rationing on the interbank market or the need to fund a Basel III contingency liquidity portfolio. The global crisis has also brought to public attention a third special case that creates the need for an advanced approach to FTP, whereby the credit riskiness of a specific asset of the bank differs from the average credit riskiness of the asset portfolio.¹²

FTP and bank's asset-risk-adjusted fund transfer price (FTP5)

In many situations, a bank's credit approval committee will consider a loan, the riskiness of which differs from the average riskiness of the bank's assets. Consider the following example: the assets of a bank are funded with deposits, interbank debt and equity. The rating of the bank is A, with a cost of interbank debt of 5.6%.

Assets	Deposits
	Interbank debt (A-rated, 5.6%)
	Equity (10%)

Evaluate the following loan proposal: the funding of a very safe (AAA-equivalent) loan of 100 yielding an expected return of 5.5%. The new, very safe asset is funded with 2 parts of equity and 98

parts of interbank debt. The overall cost of equity is 10% and the corporate tax rate is 40%. In capital markets, the expected return on AAA-rated corporate bonds is 5%.

If we use the overall cost of debt and cost of equity of the bank, the foundation economic profit used to evaluate performance would be measured as follows:

$$\text{Foundation economic profit} = \text{profit} - \text{cost of allocated equity} \\ = (1 - 0.4) \times [5.5\% \times 100 - 5.6\% \times 98] - [10\% \times 2] = -0.1928$$

The economic profit being negative, the loan would not be accepted.

In the above example, the foundation economic profit would underestimate the value created by the safe loan because it would charge a too high average cost of interbank debt and equity. There are two flaws in this approach. The first, and more significant, is that it fails to recognize that taking a very safe (AAA-equivalent) asset (partly funded with equity) reduces the overall risk of the debt of the bank. The marginal cost of debt funding should be less than 5.6%. The second is that the overall cost of equity of 10% does not recognize the specific risk of the loan.

If it is not careful, the bank could find itself in a vicious circle, avoiding safe loans and funding risky loans that later lead to a further downgrade. One can argue that the funding of a safe asset would not change the market perception of the riskiness of the bank in the short term. This may well be true as the opacity of accounts could hide the change in the riskiness of the bank. However, opacity disappears in the longer term and the market will realize the improved soundness.¹³ Proper bank corporate governance rules call for long-term value creation [Dermine (2012)] and one therefore needs a FTP methodology that recognizes changes in the riskiness of the bank. The advanced economic profit approach makes it possible to respond to these flaws.

¹² In our analysis of the impact of the contingency liquidity buffer, an investment in low-risk liquid assets will reduce the average riskiness of the bank's assets. If this effect might go unnoticed in the short term, it should, with more transparency, lead to a higher rating of the bank and a reduction in its cost of funds. This effect will reduce the net cost of the contingency liquidity buffer. A methodology discussed in the next case analyzes the case of a change in the riskiness of bank's assets.

¹³ An official Swiss enquiry found that one of the reasons for the problems that UBS experienced during the crisis was the evaluation of very risky assets booked in New York with a fund transfer price that reflected the high rating of the overall bank [Swiss Federal Banking Commission (2008)].

An intuitive introduction to asset-based FTP is as follows. It is based on a bank valuation model developed by Dermine (2009). The traditional balance sheet of the new loan is rewritten as the sum of two equity-funded positions.

Traditional balance sheet	
New safe loan 100 (5.5%)	Debt 98 Equity 2

In the traditional balance sheet, the loan is funded by debt and equity. One refers to levered equity as some debt is used in the funding of the asset. This traditional balance sheet can be expressed in a revised manner:

Revised balance sheet (sum of unlevered 100%-equity financed positions)	
New safe loan 100 (5.5%) - Debt 98 (5% - ε) (Short position)	Equity 100 (5%) Equity 98 (5% - ε)

Under the revised balance sheet, the leveraged loan is identical to the sum of a 100% equity-funded loan and a short position in debt (indeed, the debt of a company, the obligation to pay cash out, is equivalent to shareholders having a short position in a bond). The opportunity cost for the first position – equity funding the safe loan – is the expected return on similar-risk corporate bonds, 5%. Indeed, instead of making the safe loan, the bank can return the funds to shareholders who can buy similar-risk corporate bonds on the market. The expected cost of the marginal debt used to fund the loan is 5% - ε. Protected by the equity cushion of 2, the expected marginal cost of debt funding should be less than the expected return required on the new asset, 5%.

In the revised balance sheet (the sum of two 100% equity-financed positions), the advanced economic profit is equal to:

$$\text{Advanced economic profit on loan: } [(1-0.4) \times 5.5\% \times 100 - 5\% \times 100] + [-(1-0.4) \times (5\% - \epsilon) \times 98 - (-(5\% - \epsilon) \times 98)] \approx 0.26$$

The first part represents the economic profit on the loan, funded 100% with equity (the after-tax return on the loan net of the cost of equity, the return available to shareholders on the corporate bond market). The second part represents the economic profit on the debt (that is, the after-tax cash outflow on the debt net of

the opportunity cost of equity (the borrowing opportunity cost available to shareholders on the market).¹⁴

In the advanced approach, we ignore the overall cost of debt and the overall cost of equity, but rather focus on the marginal/incremental risk-adjusted specific opportunity rate. The advanced economic profit being positive, the loan should be accepted.¹⁵

One could argue that financial markets are not so well informed and that they will not recognize the change in riskiness of the bank when it funds a safe asset. As stated above, this might well be the case in the short term, but boards of banks should be concerned with long-term value creation and accept that the market will soon grasp the change in riskiness of the bank. As this might take time, it is advisable to conduct two evaluations of the economic profit of a transaction: a short-term evaluation based on foundation economic profit (based on current average cost of funds) and a long-term advanced economic profit that recognizes the marginal risk of the new transaction.¹⁶

FTP and matched-maturity funding (FTP6)

In the case of the Basel III Contingency Liquidity Buffer analyzed above, it is assumed that an extra dollar of loan would be funded on the short-term money market, a case of maturity transformation. Due to the new Basel III regulation on the contingency liquidity buffer, this prompted us to analyze the additional marginal effect on the liquidity buffer of granting an extra dollar of loan or collecting an extra unit of deposit. Funding of some assets on the short-term interbank market might not be feasible if a second Basel III liquidity regulation, the Net Stable Funding Ratio (NSFR), is binding [Basel Committee (2011)]. This regulation, which is to be applied in 2018, demands that on- and off-balance sheet positions that the bank must keep over one year be funded with funds with more than one-year maturity. In the event that this regulation is binding, a long-term loan can

¹⁴ In this example, it is assumed that large shareholders face the same cost of funds as the bank for the marginal funding of the new asset, 5% - ε. The calculation of the advanced economic profit is an approximation as the very small ε has been ignored.

¹⁵ An alternative approach to the sum of unlevered 100%-equity financed positions is to choose a funding structure (mix of debt and equity) that keeps the cost of bank debt constant [Dermine (2009)]. In that case, the marginal cost of debt is equal to the overall cost of debt of the bank.

¹⁶ Two financial techniques can be used by banks to ease the short-term effect resulting from opacity. The first is securitization of the safe asset. Securitization will force the market to evaluate the riskiness of the specific safe asset. A second technique is to use collateralized funding. The safe asset being used as a collateral should allow the bank to access lower-cost funding.

no longer be funded with short-term market funding (with the resulting impact on the contingency liquidity buffer analyzed above), and will have to be funded with long-term funding, such as a long-term bond. The cost is likely to be higher as it could incorporate a liquidity spread.¹⁷ In the event that long-term loans must be funded by long-term funding, the relevant fund transfer price will be the long-term market rate on bank's debt. The search of an adequate fund transfer price must take into account the liquidity constraints imposed by the bank or the regulator.¹⁸

So far we have ignored the risk of bank default. It has been assumed implicitly that the cost of interbank or bond funding would be met. Since the global banking crisis, however, the risk of bank default has increased significantly and the spreads on bank debt and credit default swaps (CDS) have become significant, more than 6% in several European countries. The risk of bank default is often the result of a risk of country default (sovereign risk) when banks hold a large volume of domestic country bonds or when the market anticipates that a country in default could nationalize its banking system to access domestic deposits. Figure 4 illustrates the very strong correlation between spreads on government and bank debt. Again, this is a new situation for banks from OECD countries, that has frequently been met in emerging markets.

Two methodologies to incorporate the bank's credit spread in FTP are discussed next.

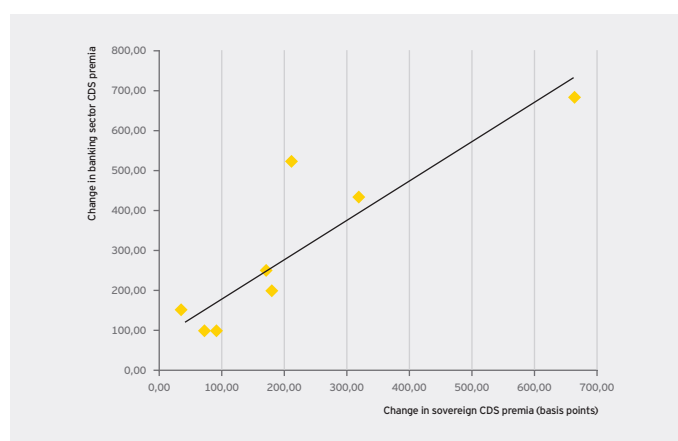
FTP and bank's credit risk spread: conditional and unconditional approach (FTP7)

In this seventh and final specific case of FTP for deposits and loans, we analyze the situation in which the risk of bank default has created a credit spread on the bank's funding. Should this spread be incorporated in the fund transfer price?

To ease the intuition, we consider the case of a one-year-to-maturity risky asset A, with contractual return a. The distribution is binomial: there is a probability (p) that the loan is repaid, and probability (1 - p)

17 As explained above, corporate finance theorists attribute the existence of a liquidity spread to agency problems between outsiders (bondholders) and insiders (bank's managers or shareholders). A second reason for a higher spread is a pure bank default risk spread. This last case is analyzed next.

18 As discussed in the case of the asset credit-risk approach, two methods can be used: a loan funded with a leverage structure (long-term funding and equity), or a portfolio of two unlevered positions: a loan funded 100% with equity (and as a cost of equity, the return expected on same-maturity/risk corporate bonds) and a short position in debt.



Figures 4 - Changes in sovereign and banking sector CDS premia for a sample of European countries (22 November 2010 to 22 November 2011)

Source: Financial Stability Report (2011).

of default with a recovery REC.¹⁹ The loan is funded with corporate bonds C (with contractual return c) and equity. The contractual return is the rate promised to the holders of assets. It will only be paid in the case of no default.

Asset A (a)	Corporate bonds C (contractual cost c) Equity E (unconditional cost of equity R _E)
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The cost of equity is the CAPM risk-free rate plus a risk premium. It is an unconditional cost of equity, giving the expected return on shares over both states of default and no default. The unconditional cost of equity has to be distinguished from the conditional cost of equity introduced below. The conditional cost of equity gives the return on shares in the case of no default. It is assumed that the asset default puts the bank into default. In that case, bond holders take control of the bank and recover the asset, REC.

The payoffs on the asset, bonds, and equity are given below for the two states of the world, default and no-default.

	Asset	Bond	Equity
No default (probability p):	(aA + A)	(cC + C)	(R _{E, conditional on no default} + E)
Default (probability (1 - p)):	REC	REC	0

19 The case of a continuous asset distribution for a risky bank is developed in Dermine (1986).

A project creates value when the unconditional expected return on the asset is higher than the unconditional expected cost of funds:

$$p \times (aA + A) + (1-p) \times REC > [p (cC + C) + (1-p) REC] + [(1-p) \times (R_{E, \text{conditional on no default}} E + E) + p \times 0].$$

This is the approach adopted in Dermine (1986) for a risky bank or by Cooper and Davydenko (2007) for risky corporate finance projects. It is an unconditional approach calculated for two states of the world, default and no default. Another, conditional approach, is possible. One observes that the asset return in case of default (recovery REC) is identical to the payoffs to the bond holders in case of default (they take over the bank and the assets). One can thus ignore the state of default and focus exclusively on the case of no default. In the conditional approach (the no-default case), the asset return has to be larger than the conditional cost of funds:

$$(aA + A) > (cC + C) + (R_{E, \text{conditional on no default}} E + E).$$

In this last approach, the conditional case of no default, the cost of debt is the contractual rate paid by the bank (including the credit spread), and the cost of equity is the return demanded by shareholders in the case of no default, when they know that there is a risk of receiving nothing in the case of default. Where we introduce the risk of bank default, two approaches to FTP are feasible and fully consistent with one another: an unconditional approach over two states of the world (default or no default), and a conditional approach (the case of no default).

We favor the second conditional approach, with the state of no default. Indeed, for the communication of a fund transfer price internally, it is easier to communicate the current contractual cost of debt which includes a credit risk premium. The communication of an expected cost of bank debt would be more difficult. But, one must note that in the conditional approach the relevant cost of equity is the conditional cost of equity, the return expected by shareholders in the case of no default. One must realize that the conditional cost of equity is higher than the unconditional CAPM cost of equity, as there is a need to remunerate shareholders for the risk of receiving zero return in the case of default.

Until recently, the consequence of a risk of bank default for FTP and the cost of equity had been ignored in the OECD banking

world as the risk of bank default was low. Currently, much higher credit spreads in a number of countries have underlined the need to correctly incorporate the risk of bank default into the cost of funding, debt and equity. The bank must choose between an unconditional or conditional approach to FTP.

Conclusion

Fund transfer pricing is fundamental for evaluating the profitability of on-balance sheet products, for pricing and the design of bank strategy. It is fundamental for assessing the degree of competition in banking markets. This paper has drawn attention to five issues that have been previously ignored: rationing on the interbank market, the creation of a Basel III contingency liquidity buffer, the necessity to adjust FTP to the credit riskiness of specific assets of the bank, the need to include a liquidity premium in the case of long-term funding, and finally, the choice of a consistent methodology to incorporate the credit spread on the bank's own debt due to the perceived risk of bank default.

The seven cases which have been identified require a specific FTP methodology:

Foundation approach

- Products with fixed maturity (FTP1)
- Products with undefined maturity (FTP2)

Advanced approach

- Rationing on the interbank market (FTP3)
- Basel III contingency liquidity buffer (FTP4)
- Specific asset risk (FTP5)
- Long-term funding constraint (FTP6)
- Credit spread on bank's own debt (FTP7)

Following the global banking crisis, there is a pressing need to revise the methodology used to calculate FTP for deposits and loans. Sound corporate governance that focuses on long-term value creation calls for a distinction between short-term profit evaluation, likely to be observed in the case of opacity, and longer-term profit evaluation, when the market becomes transparent.

Appendix: FTP and Basel III contingency liquidity buffer

Here is the bank's balance sheet, R_e denoting the cost of equity:

Loan: L (l)	Deposits: D (d)
	Interbank deposits: I (i)
Liquid bonds: B (b)	Long term funding: F (f)
	Equity: E (R_e)

Balance sheet constraint is: $L + B = D + I + F + E$

Contingency liquidity constraint is: $B = (\alpha \times D) + (\beta \times I) = F^{20}$

The last constraint implies a revised balance sheet constraint $L = D + I + E$

One would expect $\alpha < \beta$ (interbank deposits, being more volatile, need a higher liquidity contingency buffer), and $f > b$ (liquidity premium raising the cost of long-term funding).

$$\text{Economic profit} = [iL + bB - dD - il - fF] - R_e E$$

$$= iL + b(\alpha D + \beta \times I) - dD - i(L - D - E) - f(\alpha D + \beta \times I) - R_e E$$

$$= iL + b(\alpha D + \beta \times (L - D - E)) - dD - i(L - D - E) - f(\alpha D + \beta \times I) - R_e E$$

$$= iL + b(\alpha D + \beta L - \beta D - \beta E) - dD - i(L - D) - f(\alpha D + \beta L - \beta D - \beta E) + (i - R_e)E$$

$$= L \times (i + b\beta - i - f\beta) + D \times (b\alpha - b\beta - d + i - f\alpha + f\beta) + (-b\beta + f\beta + i - R_e)E$$

$$= [L \times (i - i - \beta(f-b))] + [D \times (-d + i + (\beta - \alpha)(f - b))] + [(i + \beta(f - b) - R_e)E]$$

One observes that the separation theorem is restored. In this case, at the optimum, the marginal income on loans should equal the marginal funding cost given by the *Loan Fund Transfer Price (FTP-L)*:

$$\text{Marginal income on loan} = \text{FTP-L} = i + [\beta \times (f - b)]$$

The marginal cost of funding the loan includes the interbank funding rate plus the cost of carrying a liquidity cushion (cost of long-term funds net of the return on contingency liquid asset).

At the optimum, the marginal cost of deposits must be equal to the marginal return given by the *Deposit Fund Transfer Price (FTP-D)*:

$$\text{Marginal cost of deposit} = \text{FTP-D} = i + [(\beta - \alpha) \times (f - b)]$$

The marginal return on deposits is equal to interbank funding rate plus the net cost reduction from a reduced contingency liquidity requirement (when $\alpha < \beta$).

Notice that the transfer price for loans and deposits is no longer identical because the impact of an extra unit of loans and deposits on the contingency liquidity requirement differs. One extra dollar of loan demands one dollar of interbank funding and a contingency liquid buffer. One extra dollar of deposits requires one dollar less of interbank deposits, with an impact on the contingency buffer which is a netted effect (smaller buffer for stable retail deposits, and larger buffer for volatile interbank deposits).

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²⁰ It is assumed the contingency liquid assets are funded with long-term debt because the cost of equity RE is more expensive.