pOAS: A NEW PROFITABILITY MEASURE FOR

LOAN ACQUISITION & LOAN PORTFOLIO MANAGEMENT

A LOW INTEREST RATE REGIME SOLUTION

by

Thomas S.Y. Ho, Ph.D.
and
Gnanesh Coomaraswamy, Ph.D.

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Background

Accounting treatment of the net income of loans often fails to measure the loan profitability over its life on a cash-flow basis. The income simulation typically identifies the profitability over the near term and not the entire life of the loan.

Consider a 30-year fixed-rate mortgage loan. While an upward-sloping funding curve would result in decreasing margins over time, the simulation of profits over a shorter period would often overstate long-term profitability.

Therefore, an appropriate measure of profitability over the life of the loan is of paramount importance in managing the profitability of loans. While the measure should ensure appropriate implementation of income simulation, it also must include loan pricing, hedging, funding, and financial reporting.

Purpose

The purpose of this paper is to introduce an approach that measures the profitability of an on-balance-sheet whole-loan portfolio. The methodology identifies the maximum-releasable profit for the life of a fixed-rate mortgage whole-loan portfolio.

This is a robust profitability theoretical framework that can resolve multiple complex issues in managing a loan portfolio today.

Note: This paper may not be all-inclusive with regard to implementation. The practical, precise applications will depend on current processes and requirements of the bank. However, the model can be adjusted to these specific cases.

Results

The proposed profitability measure and analysis can assist financial institutions with a more precise way to:

- Identify the profitability in acquiring a loan portfolio based on the purchase price.
- Determine the releasable spread income from the on-balance sheet portfolio over the life of the loans.

As a result, the methodology can enhance the bank's business model by uncovering opportunities to expand product offerings, enhance the funding advantage, and improve pricing and hedging strategies to enhance profitability.

In sum, the method enables a more coherent financial reporting framework and measure among multiple departments by facilitating increased transparency, comprehensiveness and consistency.

Key Elements of the Proposed Model

The proposed model:

(1) Uses the LIBOR (Swap) curve as the fund transfer pricing (FTP) curve between assets and liabilities, as opposed to using the funding curve of the institution. FTP separates the profitability of the assets and liabilities.

(2) Establishes an asset performance benchmark based on bullet par bond from the funding curve. (In this paper, borrowings such as FHLB Advances are referred as "bonds.")

(3) Determines the option adjusted spread (OAS) of the loan commitment portfolio off the benchmark portfolio as the "maximum releasable profit," called pOAS.

As a result, the proposed model uniquely:

- Identifies the profitability of the whole-loan portfolio and the funding advantage of using callable funding separately.
- Uses the liquid-swap curve for FTP to ensure consistent option pricing of prepayments and swaptions.
- Takes the term structure of the spread between the swap curve and the funding curve into account for the life of the loans.

Theoretical Framework

Bifurcation

Arbitrage-free modeling determines the option value by identifying the cost of replicating the option using dynamic hedging.

Using an arbitrage-free interest rate model allows for bifurcation of the embedded option from a fixed income instrument. The value of a mortgage loan is the sum of the present value of cash flows (CF) and options Ω

$$V = PV(CF) + \Omega \qquad (1)$$

where CF is the interest and principal of the fixed income instrument with prepayments and amortization generated by the projection of the forward curves.

The option value Ω represents the interest rate risk due to prepayments and can be replicated by a portfolio of caps and floors. Arbitrage-free modeling determines the option value by identifying the cost of replicating the option using dynamic hedging.

Funding Curve Adjustment

The funding of the loan cash flow is based on the funding curve and not on the swap curve. The methodology begins with matching the loan principals with par-priced bullet funding of the institution. (The use of par bonds is only for clarity of exposition).

The value of a portfolio of par-priced bullet bonds of an institution would have a premium or discount to the swap curve, depending on the level and shape of the funding curve. In general, the funding curve is higher than the swap curve for longer maturities, and is adjusted (deducted) from the spread income of the mortgage loans.

An OAS is the OAS estimated from the market loan prices. OAS has the economic meaning of "releasable profit" or option-adjusted spread income. That is, OAS represents the spread income to the investors isolating the option cost and the pricing curve. The model below shows the model is adjusting for the funding curve spread.

The loan price determines the Loan OAS. Therefore, we have equation (2) as specified by the bifurcation

$$V\,(\text{loan}|\text{discounted by loan OAS}) = PV\,CF\,(\text{discounted by loan OAS}) - \text{Option}\,\Omega \qquad (2)$$

The profit released from the mortgage loan has to have a haircut to pay for the bond value premium and the option cost to hedge the prepayment option. Let the haircut be (LoanOAS – pOAS), for some spread pOAS, such that:

$$PV\,CF\,(@pOAS) = PV\,\text{proxy Bullet bond}\,(@0\,OAS) + \text{Option}\,\Omega \qquad (3)$$

The first term of Equation (3) accounts for the premium of using the funding curve to match the cashflows. The second term pays for the option hedge cost, whether by caps/floors or other options or by dynamic hedging. We subtract the option cost to both sides of Equation (3), we have

$$PV\,CF\,(@pOAS) - \text{Option}\,\Omega = PV\,\text{proxy Bullet bond}\,(@0\,OAS) \qquad (4)$$

By the bifurcation construction, where the loan value is the sum of cash flows and option, we have

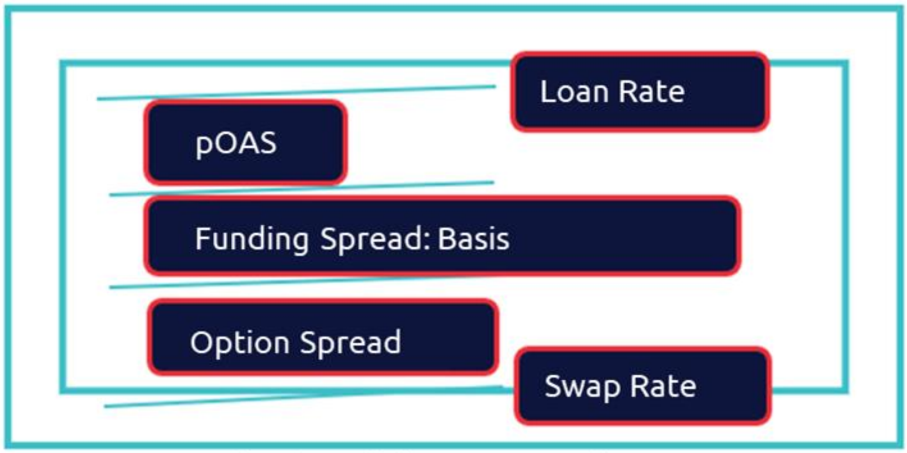
$$V(\text{loan}\,|\,pOAS) = PV\,CF\,(@pOAS) - \text{Option}\,\Omega \qquad (5)$$

Since prepayment behavior is not affected by the OAS, substitute (4) into (5) we have

$$V(\text{loan}\,|\,pOAS) = PV\,\text{proxy Bullet bond}\,(@0\,OAS) \qquad (6)$$

Equation (6) defines pOAS. pOAS is the OAS of the loan such that the value equals the proxy bullet bond portfolio.

The model shows that the profit release of Loan OAS has to be reduced to pOAS to pay for the cost of funding relative to the swap curve.



Attribution of the mortgage loan rate

For clarity of exposition, consider that case when there is no interest rate volatility, then the value of the loan would be equal to PV CF (@pOAS) and equation (6)

V(loan | pOAS) = PV proxy Bullet bond (@0 OAS) (6)

becomes

PV CF (@pOAS) = PV proxy Bullet bond (@0 OAS) (7)

That is, when there is uncertainty, Equation (6) allows for the cost of hedging the option. But, when there is no uncertainty, Equation (6) reduces to Equation (7) by ignoring the hedging cost of the option.

Summary

- The swap curve is used as the fund transfer pricing curve because the swap curve is liquid, standard in the capital market, and the prepayment options can be modeled and relatively priced in the options market.
- Apply the Replication Model: Mortgage Loan = Cash Flow (CF) generated by the forward curves + Embedded Option
- Replicate Cash Flow (CF) by a portfolio of par bullets from the funding curve.

pOAS Applications

Acquisition Decision

pOAS can be used as an indicator of fill or kill.

The pOAS, as calculated in this paper, is the maximum releasable profit, but does not include operating expense, prepay model risk or other risk factors.

Once adjusted for these risks, the adjusted pOAS can now be used as a target spread to accept or reject mortgage pools for purchase to be held on the bank balance sheet.

$pOAS_{cur,}$ along with OAS_{cur} as calculated above, measure the profitability of a new loan bought at prevailing market price and funding cost.

On-Balance Sheet Portfolio Profitability Measure

pOAS can be used as an indicator of the profitability of the portfolio.

Along with the portfolio's historical purchase information (OAS_{pur}, $pOAS_{pur}$) and the current market conditions, we can arrive at the adequacy of the current reserve and can come up with decision rules to either increase or decrease the necessary reserve.

Specifically, pOAS is specified by (1) loan portfolio OAS, (2) current funding curve and (3) capital C such that Loan value = benchmark bond value (discounted by funding curve) + Capital C.
By definition, Economic Value of Equity (EVE) = loan value - bond portfolio value. Therefore, by eliminating loan value from both equations, we have

EVE = C + (benchmark bond portfolio - bond portfolio value)

Hence, pOAS is consistent with EVE which captures historical portfolio performance. For example, if the funding advantage is significant, then the portfolio value would increase leading to higher maximum releasable profit.

In essence pOAS can apply to an existing mortgage portfolio using the portfolio current model price (or OAS based on model price) in place of the market (acquisition) prices in the fill or kill decision.

When the bond portfolio is the same as the benchmark portfolio, then the above equation shows EVE equals the capital, as expected.

pOAS, Accounting Income, and Income Simulations

Funding Advantage

We have limited our discussion to bullet bonds for match funding and the use of dynamic hedging for replication of the embedded option.

The proposed analytical framework can be used for callable borrowings on the funding side that combines the funding, duration, and convexity needs of the mortgage. Funding Advantage can also be analyzed in a similar framework.

Accounting Anomalies and Risk Charge

Institutions amortize the premium either 1) to its average life on a pool of loans based on expected prepays or 2) to its maturity on individual loans without any prepay considerations. 1) causes income volatility as prepay expectations change, and the amortization is re-calculated and adjusted in current income. 2) solves this whipsaw effects of FAS91, but income is overstated by slower amortization. We refer to this the Amortization Accounting Anomaly (AAA).

Also, accounting income and income simulations often do not account for risk charges, and thus, overstate profitability.

Conclusions

> pOAS can be used to both to make purchase decisions based on required target spread and to monitor the profitability of the portfolio on-balance sheet responding to current market conditions.
>
> The proposed methodology can be used for specific bank funding and hedging strategies and can evaluate the risks and returns of different products and portfolio management styles.

About the Authors

Thomas S. Y. Ho, Ph.D., is CEO and founder of Thomas Ho Company, Ltd., a New York-based financial engineering company. He is the co-author of the Ho-Lee Model and has over 35 years of experience in financial modeling. Ho is the author of more than 80 books and refereed publications.

Gnanesh Coomaraswamy, Ph.D., FRM, CFA, has over 30 years of experience in financial engineering, portfolio management and risk management. He has held senior positions at Morgan Stanley, GE Capital, and Federal Home Loan Bank of Chicago. He was a senior member of the FHLB MPF™ founding team where he actively managed a $50B whole-loan portfolio.

THC Financial Engineering

Please contact us:
support@thomasho.com
www. thomasho.com
phone: 269. 558. 5004

Thomas Ho Company, Ltd.
New York Office:
55 Liberty St, Suite 4B
New York, NY 10005

Michigan Office:
14900 West Michigan Ave.
Marshall, MI 49068