Core Deposits: Theory & Practice

PATH 2007

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who is the ALM Network?
introduction

- An independent consulting firm providing financial institutions with customized ALM services.
- Long-time IPS-Sendero client (20+ years)
- Our consulting network has worked with banks of all sizes ranging from de novos to large regional banks.
  - every bank receives personalized service, with a customized solution based on their unique requirements
- Articles and core deposit products/services forthcoming
  - In “beta” with community and regional banks
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core deposit theory

- rates
- liquidity
- valuation
- duration
  - core deposits = non-maturity deposits

theory: rates

- Beginner
  - Function of short market rates
    - Fed Funds
    - 3 month Treasury
    - 3 month LIBOR
  - Model as spread to index
- Intermediate
  - Single/multiple rates
  - Lags
  - Model as spread/proportion to index
- Advanced
  - Stochastic or Structured Lattice
    - Model in LPS
  - Particle physics mathematics
    - Transform optimization model into multi-factor regression model
  - Prior PATH presentations

theory: liquidity

- Beginner
  - Static balances
  - OTS decay rates
- Intermediate
  - Cash flow projections w/ assumed terminal life
- Advanced
  - Stochastic
  - Multi-factor behavioral models

theory: valuation

- Beginner
  - Book value
  - OTS model
- Intermediate
  - DCF inside ALM
  - Congruency with rates & liquidity
  - Marketplace results as benchmark
    - Closed-form solutions as secondary benchmark
- Advanced
  - Closed form solutions
  - Stochastic
  - Lots of papers published
    - Jarrow/van Deventer (used in this presentation)
    - O’Brien/FED

theory: valuation example

A financial instrument without cash flows can be priced at a discount to a premium depending on your assumptions

Simple Passbook example	
Balance =	$100
Interest rate =	4%
Interest expense =	$4
	Cash flow
No new balances, no withdrawals	0
Deposit fees = Servicing cost	0
Interest expense =	$4
Interest credited (balances grow 4%)	($4)
Net CF	0
PV =	$100
Premium =	0
Duration =	0

theory: valuation example

Simple pricing model

Cash flow basic formula =	Cash flow in - cash flow out Net CF
Present value =	Net CF, discounted for time and interest rate
PV =	Net CF/(1+rate)^time
Deposit CF =	Cash flow in - cash flow out
Cash flow in =	Deposit fees Balance increase (includes interest credited? is this in formulas twice)
Cash flow out =	Interest expense Servicing cost Balance decrease
Deposits sometimes backwards	Cash flow out - cash flow in

theory: valuation example

Assumptions		June 1987-2007
Variable index (Fed Funds)	5.00%	4.84%
Perpetual (10 yr swap)	6.00%	6.79%
Deposit rate =	4.00%	
Servicing cost	1.00%	
Deposit fees	-1.00%	
Net servicing	0.00%	
Growth rate	0.00%	
Assumed final	perpertual	

theory: valuation example

Use market value overrides in SVAL

Variable rate, Indexed MM example		**100**	
Fed Funds, or generally variable rate =		**5%**	
80% of Fed Funds		**4%**	**80%**
Interest Expense =		**$4**	
PV of variable rate perpetual =	**Percent of index**		
Fed Funds @ par, so 80% of par			
PV of variable rate perpetual =		**$80**	
Premium		**$20**	
Duration		**0**	**value doesn't change**

Proof: Cox, Ingersoll, Ross (1980)

theory: valuation example

Can calculate in ALM models with really long terminal life assumption

Fixed rate, Passbook (hard-coded) example	**100**
Rate	**4%**
Interest Expense =	**$4**
PV of fixed rate perpetual =	**Balance*Rate/Perpetual rate**
Long rates, 10 year and/or perpetual =	**6%**
PV	**$66.67**
Premium	**$33.33**
Duration	**= 1/Perpetual rate**
	16.67
proof well-known	

theory: valuation example

Value combines variable + fixed rate examples, as above

Looks like fixed rate is better, but what about retention in increasing rate scenarios?

MMDA, with floor	100	100	100	100
Regression model of rate, y	= a + bx			
	= floor + sensitivity*index			
Fed Funds, or generally variable rate =	5%	5%	5%	5%
Floor (fixed)	0.00%	0.25%	1.00%	4.00%
Sensitivity	80%	75%	60%	0%
Sensitivity*index	4.00%	3.75%	3.00%	0.00%
Rate	4%	4%	4%	4%
From above				
Long rates, 10 year and/or perpetual =	6%	6%	6%	6%
PV floor (rate*bal)/perpetual	$0.00	$4.17	$16.67	$66.67
PV variable	$80.00	$75.00	$60.00	$0.00
PV	$80.00	$79.17	$76.67	$66.67
Premium	$20.00	$20.83	$23.33	$33.33
	variable rate			fixed rate

theory: valuation example

Looks like fixed rate is better, but what about migration in decreasing rate scenarios?

Regression model of rate, y	= a + bx			
	= floor + sensitivity*index			
Fed Funds, or generally variable rate =	2%	2%	2%	2%
Floor (fixed)	0.00%	0.25%	1.00%	4.00%
Sensitivity	80%	75%	60%	0%
Sensitivity*index	1.60%	1.50%	1.20%	0.00%
Rate	1.60%	1.75%	2.20%	4.00%
From above				
Long rates, 10 year and/or perpetual =	6%	6%	6%	6%
PV floor (rate*bal)/perpetual	$0.00	$4.17	$16.67	$66.67
PV variable	$80.00	$75.00	$60.00	$0.00
PV	$80.00	$79.17	$76.67	$66.67
Premium	$20.00	$20.83	$23.33	$33.33
	variable rate			fixed rate

hmmm. make sense....

theory: valuation example

Flat yield curve scenario…

Long rates, 10 year and/or perpetual =	5%			
Fed Funds	5%	5%	5%	5%
Sensitivity	80%	75%	60%	0%
Rate	4%	4%	4%	4%
Premium	$20.00	$20.00	$20.00	$20.00

theory: valuation example

Inverted yield curve scenario…

Long rates, 10 year and/or perpetual =	4%			
Fed Funds	5%	5%	5%	5%
Sensitivity	80%	75%	60%	0%
Rate	4%	4%	4%	4%
Premium	$20.00	$18.75	$15.00	$0.00

theory: valuation example

In the basic industry model, where deposit rates are a function of short rates and valuation is based on long rates, the slope, not level determines value

Premium table	Sensitivity			
Curve slope	80%	75%	60%	0%
Positive +1	$20.00	$20.83	$23.33	$33.33
Flat	$20.00	$20.00	$20.00	$20.00
Inverted -1	$20.00	$18.75	$15.00	$0.00

theory: valuation example

When measuring value creation in a economic capital sense, as in EVA® or SVA, the cost of capital is used (at least for the assigned capital). The cost of capital is also used for project/business segment evaluation.

	PV of 2% spread		% of perpetuity	
	Long-term rate	Cost of Capital	Long-term rate	Cost of Capital
	6%	12%	6%	12%
1	1.89	1.79	5.7%	10.7%
5	8.42	7.21	25.3%	43.3%
10	14.72	11.30	44.2%	67.8%
17.5	21.30	14.37	63.9%	86.2%
35	29.00	16.35	87.0%	98.1%
100	33.24	16.67	99.7%	100.0%
perpetuity	33.33	16.67	100.0%	100.0%

theory: duration

Duration is a calculation, not an input

Some say core durations = 0

Others say core durations = 17

Both/neither are right

- Simple
  - Ignore
  - Base on average or assumed life
    - 17.5 year average life = 35 year terminal life
- Intermediate
  - Effective duration
    - Scenario-dependent prices
  - Modified duration
    - Based on discounted cash flows
- Advanced
  - Multi-factor regression/econometric approaches
  - Complex stochastic approaches

core deposit practice

- rates
- liquidity
- duration
- valuation
- back-testing

practice: rates

Intermediate and advanced practitioners should back-test their sensitivities

- Beginner
  - Model as spread to index
  - This relationship changes as rates change
- Intermediate
  - Single/multiple rates, lags
  - Model as spread/proportion to index
  - Relatively good long-term correlations (80%+/-)
  - Paper in Q3/Q4
    - (will be available at www.almnetwork.com after publication)
- Advanced
  - Good in theory
  - Present papers, books, conferences
  - Recent book had 3 different stochastic models
    - Rate, liquidity, valuation
    - Noted none were used at his bank

practice: rates

Intermediate and advanced practitioners should back-test their sensitivities

- Back-testing deposit sensitivities
- Great article in Bank ALM, March/April 2007
  - Mark Gim, Washington Trust
- Related question – what are we trying to get right?
  - Is it precision at the model line level?
    - Some shops
  - Or is it directional accuracy and reasonably close at bank level?
    - Model migration/dual betas, or
    - Higher sensitivity for Core in + rate scenarios
    - Both can get you there?

practice: rates

- Compare to competition if price-taker
- Set prices if market leader?
  - What is the market?
    - Local
    - National
    - Internet
    - International/ING
- Maximize earnings and/or value?
  - May have unacceptable runoff if maximize short-term earnings, which destroy value
  - How do banks incent new 0.50% NOW deposits?

practice: rates

- What is the hedge?
  - Replicating portfolio or
  - Partial rate sensitivity

practice: liquidity

- Beginner
  - Don’t measure
  - Anecdotal
- Intermediate
  - Ad hoc measurement
    - Current CPR type, future PSA type
  - Does past predict future?
    - 25 yr. old vs. parents & grandparents
- Advanced
  - Periodic measurement & benchmarking
    - Stochastic (enough scenarios to back-test, but…)
    - Multi-factor behavioral models
  - See above comment

practice: valuation

coolest bank name that completed a branch acquisition:

Crazy Woman Creek Bancorp

Branch deal stats 2000s		Premium (%)	Premium Paid ($000)	Deposits ($000)
summary	587	8.27	6,082,539	73,552,654
max		22.91	2,144,000	13,400,000
min		(0.18)	(475)	191
median		6.25	1,424	20,426

includes branch, branch with loans, internet, brokered CDs, and others

practice: duration

- It is a calculation, not an input
  - Need rates and prices/cash flows

conclusion

- What matters about Core Deposits in Theory?

	Rates	Value
Level of rates?	Yes	No
Slope of curve?	No	Yes
Slope matters in multi-factor models		
Growth/Deposit flows?	No	Yes
Average life?	No	Yes

- What matters about Core Deposits in Practice?
  - Short-term & long-term earnings
    - What is the hedge?
  - Franchise value
    - Best correlation with community bank stock price in unpublished white paper was deposit franchise

Thank you

- Questions?
- If you think of them later
  - Email: fpoorman@almnetwork.com