Quantitative liquidity measures

- **Example:** The bank buys a bond at time 0 for a notional amount of 1,000,000 at a price of 98.50; the payment is settled after 3 days, when the bond's possession also passes to the bank.

Purchase of a Bond: Effects on Term Structures

Time	Operation	TSECF	TSECCF	TSAA	TSCLGC	Price	Haircut (%)
0	Buy					99.85	15
0.01	Settlement	-985,000	-985,000	1,000,000		99.85	15
0.25				1,000,000		99.85	15
0.5	Coupon	50,000	-935,000	1,000,000		99.85	15
0.75				1,000,000		99.90	15
1	Coupon	50,000	-885,000	1,000,000		99.90	15
1.25				1,000,000		99.90	15
1.5	Coupon	50,000	-835,000	1,000,000		99.95	15
1.75				1,000,000		99.95	15
2	Coupon + Reimbursement	1,050,000	215,000	—		100.00	15

Quantitative liquidity measures

- Assume now the bank decides to sell a quantity of the bond equal to a notional of 500,000 after 0.75 years. We know that this trade can be dealt to generate liquidity, so that the TSCLGC records an inflow equal to the amount times the price, including the accrued interests. (500,000 X (99.90/ 100 + 10% X 0.25) = 512,000 as well.

Selling of a Bond: Effects on Term Structures

Time	Operation	TSECF	TSECCF	TSAA	TSCLGC	Price	Haircut (%)
0	Buy					99.85	15
0.01	Settlement	-985,000	-985,000	1,000,000		99.85	15
0.25						99.85	15
0.5	Coupon	50,000	-935,000			99.85	15
0.75	sell			500,000	512,000	99.90	15
1	Coupon	25,000	-910,000		512,000	99.90	15
1.25					512,000	99.90	15
1.5	Coupon	25,000	-885,000		512,250	99.95	15
1.75		—			512,250	99.95	15
2	Coupon + Reimbursement	525,000	- 360,000	—	512,250	100.00	15

Quantitative liquidity measures

- **Assume the bank repoes the bond after 3 months for a notional amount equal to 500,000 and a period of 6 months. Given the price and the haircut of the bond, and keeping accrued interest in mind, the amount of cash received by the bank is:**
  - (500,000 x (99.85% + 10%x 0.25) x (1 - 15%) = 424,469
- **The bank pays 9% as interest on this repo transaction, so that the terminal price paid when getting the bond back is:**
  - 424,469 x (1 + 9% x 0.5) = 443,569.84
- **The difference 443,569.84 - 424,469 = 19,101.09 enters the TSECF on the date at the end of the repo.**

Quantitative liquidity measures

- **After 1.25 years the bank deals a 6-month reverse repo on this bond for a notional of 500,000. The price it pays to deliver the bond at inception is:**
  - 500,000 x (99.9%+ 10% x 0.25) x (1 - 15%) = - 424,681
- **This amount enters the TSECF and alters the TSECCF as a consequence; the TSAA increases up to 1,500,000 since the bond is in possession of the bank**
- **At the end of the reverse repo contract, assuming the interest rate paid by the counterparty is 11 %, the inflow received by the bank is:**
  - 424,681 x (1 + 11% x 0.5) = 471,396
- **Which should be considered fully as a contract cash flow, thus entering the TSECF; the bond is returned to the counterparty and consequently the TSAA is set back to 1,000,000.**

Quantitative liquidity measures

Repo and Reverse Repo of a Bond: Effects on Term Structures

Time	Operation	TSECF	TSECCF	TSAA	TSCLGC	Price	Haircut (%)
0	Buy					99.85	15
0.01	Settlement	-985,000	-985,000	1,000,000		99.85	15
0.25	Repo		-985,000	500,000	424,469	99.85	15
0.5	Coupon	50,000	-935,000	500,000	424,469	99.85	15
0.75	End repo	-19,101	-954,101	1,000,000	—	99.90	15
1	Coupon	50,000	-904,101	1,000,000		99.90	15
1.25	Reverse repo	- 424,681	- 1,328,782	1,500,000		99.90	15
1.5	Coupon	50,000	- 1,278,676	1,500,000		99.95	15
1.75	End reverse Repo	471,396	-807,386	1,500,000		99.95	15
2	Coupon + Reimbursement	1,050,000	195,899	—		100.00	15

Quantitative liquidity measures

- **Assume that after 3 months the bank buys 400,000 bonds and sells it back after 6 months at the forward price. At the start of the contract the bank pays:**
  - 400,000 x (99.85% + 10% x 0.25) = 409,400
- **This sum enters the TSECF and the quantity of the bond available increases to 1,400,000 in the TSAA. The TSCLGC is not modified.**
- **At the end of the contract (0. 75 years) the bank sells the bond back at the contract price. The sum it receives also includes accrued interest:**
  - 400,000 x (99. 9%+ 10% x 0.25) = 409,600
- **This sum also enters the TSECF, while the TSAA shows a reduction of the available quantity back to 1,000,000.**

Quantitative liquidity measures

- **Also the effects of a sell/buyback of the bond starting after 1 year and 3 months (1.25 years) and terminating after 6 months (1.75 years). The price received by the bank is:**
  - 300,000 x (99. 90% + 10% x 0.25) = 307,200
- **Which is included in the TSCLGC.**
  - 300,000 x (99.95% + 10% x 0.25) = 314,726

Quantitative liquidity measures

Buy/ sellback and Sell/ buyback of a Bond: Effects on Term Structures

Time	Operation	TSECF	TSECCF	TSAA	TSCLGC	Price	Haircut (%)
0	Buy					99.85	15
0.01	Settlement	-985,000	-985,000	1,000,000		99.85	15
0.25	Buy	-409,400	- 1,394,400	1,400,000		99.85	15
0.5	Coupon	70,000	- 1,324,400	1,400,000		99.85	15
0.75	Sell back	409,600	-914,800	1,000,000		99.90	15
1	Coupon	50,000	-864,800	1,000,000		99.90	15
1.25	Sell		-864,800	700,000	307,200	99.90	15
1.5	Coupon	35,000	-829,800	700,000	307,200	99.95	15
1.75	Buyback		-829,800	1,000,000	-314,726	99.95	15
2	Coupon + Reimbursement	1,050,000	220,200	—		100.00	15

Quantitative liquidity measures

- Start with another case in which the bank lends 500,000 of the bond after 3 months for a period of 6 months. The TSECF does not record any cash flow, whereas the TSAA shows a reduction of the available quantity of 500,000.
- After 6 months the bond is returned to the bank (the TSAA increase) and the bank receives a fee for the lending, which we assume equal to 3% p.a.: 500,000 x (3% x 0.5) = 7,500

Quantitative liquidity measures

Lending and Borrowing of a Bond: Effects on Term Structures

Time	Operation	TSECF	TSECCF	TSAA	TSCLGC	Price	Haircut (%)
0	Buy					99.85	15
0.01	Settlement	-985,000	-985,000	1,000,000		99.85	15
0.25	Start lending		-985,000	500,000		99.85	15
0.5	Coupon	50,000	-935,000	500,000		99.85	15
0.75	End lending	7,500	- 927,500	1,000,000		99.90	15
1	Coupon	50,000	- 877,500	1,000,000		99.90	15
1.25	Start borrowing		- 877,500	1,300,000		99.90	15
1.5	Coupon	50,000	-827,500	1,300,000		99.95	15
1.75	End borrowing	-4,500	-832,000	1,000,000		99.95	15
2	Coupon + Reimbursement	1,050,000	218,000	—		100.00	15

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The term structure of expected liquidity

The Term Structure of Expected Liquidity and Its Building Blocks

Years	TSECF	TSECCF	TSCLGC	TSL_e	TSAA	Price
0	0	0	0	0	30	97.00
1	22.4	22.4	0	22.4	30	97.20
2	-8.6	13.8	0	13.8	30	97.45
3	1.8	15.6	0	15.6	30	97.60
4	1.8	17.4	0	17.4	30	98.00
5	51.8	69.2	0	69.2	30	98.20
6	-1.2	68	0	68	30	98.60
7	-71.2	-3.2	3.96	0.76	26	99.00
8	1.69	-1.51	3.96	2.45	26	99.50
9	1.69	0.18	3.96	4.14	26	99.75
10	27.69	27.87	3.96	31.83	—	
100.00						
>10	-20	7.87	0	7.8		

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