



Munich Personal RePEc Archive

Pricing of retail deposits in Croatia: including the premium for country default

Vidakovic, Neven

Effectus University College for Law and Finance

28 March 2014

Online at <https://mpra.ub.uni-muenchen.de/54840/>
MPRA Paper No. 54840, posted 31 Mar 2014 11:23 UTC

Pricing of retail deposits in Croatia: including the premium for country default

Neven Vidaković

Summary

The pricing of interest rates on retail deposits in Croatia does not follow standard term structure or quantity premium for pricing deposits. Banks often pay no premium on time or on quantity of deposits. On one hand this is not surprising since the banking sector has been very liquid for last several years and the banks see deposits as a cost, but what is interesting is that the banks do not price in forward looking expectation regarding the state of economy or country rating. This paper uses a simple Black – Sholes model and incorporates forward looking expectations regarding the state of the economy into the existing deposit pricing structure for largest banks in Croatia¹.

Key words: deposit interest rate, probability of default, banks,

JEL: E43, G21, G32

Neven Vidaković
Effectus University College for Law and Finance
Trg J.F.Kennedy 2,
10000 Zagreb
Croatia
nvidakovic@vsfp.eu

¹ The views expressed herein are those of the authors and do not necessarily reflect the views anyone else.
© 2014 by Neven Vidaković. All rights reserved. Short sections of text, not to exceed two paragraphs, may be quoted without explicit permission provided that full credit, including © notice, is given to the source.

1. Introduction

Using a textbook definition the banks get their funding from two main sources: primary sources of funding and secondary sources of funding. The simplest definition found in Gregurek and Vidaković (2013) is that the primary sources of funding are funds which bank did not actively collect, while the secondary sources of funding are funds which were actively obtained by the bank. In a banking centric country like Croatia most banking deposits come from retail. Retail deposits were 62% of total deposits and 44% of total aggregate bank's balance sheet at the end of 2013. What is curious about the Croatian banking industry right now is that the banks pay little attention to the existing economic conditions in Croatia when pricing deposits. This paper tries to create a scenario of what would be the retail deposit interest rates if we include premium for country risk and adjust the premium for time.

Last five years have been particularly difficult for Croatia. To fully understand the depth of the economic crisis we can look at the two main economic indicators: GDP and unemployment. Over the course of last 20 quarters (I 2009 – IV 2013) Croatia has had real GDP decrease in 18 quarters and last 9 were negative. The unemployment figures are also a clear indicator of the economic depression Croatia is in. The unemployment at the end of 2008 was 13,7% and at the end of 2013 it was 21,6% increase of 8,9%. At the same time period the number of employed has also decrease significantly from 1.518.973 to 1.320.887. These numbers put the cost of recession at 200.000 jobs lost.

Through this time period the banking sector has been remarkably robust. During the crisis, five largest banks in Croatia have never had negative net profits. Although the profits have declined and have oscillated over the recession years, the banking sector in general and 5 largest banks in particular (which are cca 75% of the whole market) have always been profitable. However the end of 2013 brought a different picture. Total profitability for the banking sector decreased by 70% from 2012 (gross profits were 3,3 bln hrk at the end of 2012 and 1 bln hrk at the end of 2013) and for the first time one of

the top 5 banks had a loss. The decrease is even more drastic if we look at the good old days, in 2008 when total gross profits were 5,7 bln hrk. From the perspective of even rudimentary economic data of GDP decrease and increase in unemployment the decrease in bank's profitability was to be expected.

The outlook for 2014 is also negative. S&P rating agency expects another 1% GDP decrease and this does not include any major budget spending decreases which might cause even larger GDP decrease. So the banks cannot expect any improvement in the economy and the probability of worsening credit portfolio is highly likely. Poor expectations of the economic are also manifested in the credit rating which is junk, BB+ with negative outlook from Fitch.

However through this time period there have been two facts which the central bank governors and politicians have always pointed out: the banking system in Croatia is highly liquid and highly capitalized². The first fact can be verified with the fact that for five years M0 is greater than M1. The second fact can be verified from the data, at the end of 2013 the banking sector capital adequacy has been 20,88%³. However no one has addressed the fact that if the banks decide to pay out dividends from retained earnings, such payout would immediately significantly decrease both capital adequacy and bank's liquidity.

From the perspective of crisis and stability Croatia was one of the countries which did not have a significant problems with the banking sector when the crisis hit in 2009. As mentioned even today, five years into crisis Croatian banks are highly liquid and stable, unlike some other countries like Cyprus.

When the financial crisis hit Cyprus the banks had large problems. One of the ways, an exceptionally extreme ways to deal with the situation was to convert uninsured deposits into capital⁴.

This measure was a precedent in the client bank relationship. In case of Cyprus bank's clients, who entrusted the bank with their money had more than one possible result on

² There are numerous occurrences where this was pointed out by the current and previous CNB governors, for examples look at www.hnb.hr

³ The data is available from CNB publications or on its website www.hnb.hr

⁴ For more on what was done in Cyprus look at the European Commission Communication regarding Cyprus and European stabilization mechanism FAQ.

their investment: they could be turned from borrowers into shareholders. This brought a standard client-bank relationship into a whole other perspective.

From the above summary it is clear the situation in banking sector in Croatia is not optimistic. At this time the banking sector is highly liquid and highly capitalized however because of the bad loans both liquidity and capital can be affected. What is interesting though this crisis the banks in Croatia have done nothing to preserve and maintain liquidity from primary sources of funding. As a matter of fact the deposit rates have decreased from 2008. Most banks we are going to analyse in this paper pay very little for time or quantity premium on their deposits, time premium or country risk.

The retail deposit structure in Croatia does not distinguish for the possibility of extreme events, as a matter of fact when we look at the data from Table 1 we can see most banks do not separate the interest rates based on term structure or quantity. Interest rates are often the same regardless of the time or quantity deposited.

Banks have different size classes and often have no size premium or time premium. For example Bank 4 and 5 have one set of interest rates for any kuna deposit. Bank 2 has no time premium for deposits over 2 years.

From the data it is clear the banks do not include any premium on extreme events like the country default or forward looking expectations regarding the state of the economy.

Table 1: Retail deposit interest rates for 5 largest banks in Croatia

BANK 1						
HRK	1-3 months	3 - 6 months	6 - 12 months	12 - 24 months	24 - 26 months	over 36 months
500 - 49999,99	1,55	2,1	2,45	2,85	2,95	3,25
50000 - 199999,99	1,6	2,15	2,55	2,95	3,1	3,35
200000 and more	1,65	2,25	2,6	3,05	3,15	3,45
EUR	1-3 months	3 - 6 months	6 - 12 months	12 - 24 months	24 - 26 months	over 36 months
500 - 4999,99	0,75	1,25	1,7	2,05	2,15	2,2
50000 - 24999,99	0,95	1,4	1,8	2,2	2,35	2,6
25000 and more	1,05	1,55	1,9	2,35	2,5	2,7
BANK 2						
KUNA	1-3 months	3 - 6 months	6 - 12 months	12 - 24 months	24 - 26 months	over 36 months
500 - 2500,99	1,9	2,4	2,8	3,2	3,3	3,3
2501 - 5000,99	1,9	2,4	2,8	3,2	3,3	3,3
5001 - 10000,99	1,9	2,4	2,8	3,2	3,3	3,3
10001 - 25000,99	2	2,5	2,9	3,3	3,5	3,5
25001 - 49999,99	2	2,5	2,9	3,3	3,5	3,5
over 50000	2	2,5	2,9	3,3	3,5	3,5
EUR	1-3 months	3 - 6 months	6 - 12 months	12 - 24 months	24 - 26 months	over 36 months
500 - 2500,99	0,9	1,6	1,9	2,3	2,5	2,5
2501 - 5000,99	0,9	1,6	1,9	2,35	2,55	2,55
5001 - 10000,99	1,05	1,75	2,01	2,4	2,6	2,6
10001 - 25000,99	1,05	1,75	2,1	2,45	2,65	2,65
25001 - 49999,99	1,1	1,8	2,2	2,5	2,7	2,7
over 50000	1,2	1,9	2,3	2,6	2,8	2,8
BANK 3						
HRK	1 months	3 months	6 months	12 months	24 months	36 - 60 months
from 9999,99	1,60	1,70	2,00	2,05	2,10	2,15
10000 - 49999	1,85	1,95	2,05	2,15	2,20	2,25
over 50000	1,95	2,05	2,15	2,25	2,30	3,35
EUR	1 months	3 months	6 months	12 months	24 months	36 months
from 2499	0,40	0,50	0,65	0,90	1,05	1,20
2500 DO 9999	0,75	0,85	1,00	1,25	1,40	1,55
over 10000	1,00	1,10	1,25	1,50	1,65	1,80
BANK 4						
HRK	1 months	over 3 months	over 6 months	12 months		
from 2000	1,8	2,4	2,9	3,25		
EUR	1 months	over 3 months	over 6 months	12 months	over 24 months	
1000 - 2500	0,8	1,65	1,85	2,3	2,4	
2500 - 5000	0,8	1,65	1,85	2,3	2,5	
5000 - 10000	1	1,65	1,95	2,35	2,5	
10000 - 25000	1,1	1,8	2	2,4	2,6	
25000 - 50000	1,1	1,8	2,05	2,5	2,7	
over 50000	1,1	1,8	2,1	2,5	2,7	
BANK 5						
HRK	1 months	over 3 months	over 6 months	12 months	24 months	
all amounts	2,00	2,50	3,00	3,30	3,60	
EUR	1 months	over 3 months	over 6 months	12 months	24 months	
do 9999,99	1,15	1,85	2,15	2,50	2,75	
10000 - 24999,99	1,20	1,90	2,20	2,55	2,80	
25000 - 49999	1,25	1,95	2,25	2,60	2,90	
over 50000	1,30	2,00	2,30	2,65	3,00	

Source: Bank's websites

This paper tries to augment the existing interest rate structure of Croatian banks for the time premium and probability of government default. At the basic tool we use Black - Sholes formula with forward looking rational expectations agents. The theoretical explanation for the Black – Sholes formula is given in the next chapter.

2. Rational for the options model

One of main postulates of the rational expectations theory states the economic participants will make the optimal decision given the available information⁵. Before we move into the model, let us look at what is the “available information” in our case.

- The banking industry in Croatia is stable, liquid and highly capitalized, but at the end of 2013 it became clear the banks are next in line to take the brunt of the crisis.
- Highly liquid and highly capitalized industry can easily become highly undercapitalized and non-liquid if there is a large payout of the dividends to mother companies which in case of five largest banks in Croatia are all foreign companies.
- Mother companies themselves might not be as strong and capitalized as they once were. The best examples are Hypo bank and Unicredito⁶.
- In case of Cyprus the politicians have ordered a debt for equity swap in order to increase the capital of the banks. This might have been better for the owners of the deposits since the straight out liquidation of the banks would decrease the chance of repayments of large deposits.
- Croatian economy is in an economic depression and the outlook for the economic is not improving, at least for the 2014.

⁵ This does not imply the economic participants have full information, only that given their information they will make the optimal choice.

⁶ Uncredit reported a EUR 15 bln loss in 2013.

- The case of Cyprus has another important implication; it has let the Ginny out of the bottle and has opened a possibility for every country in the EU to exercise the same option in case the banks need more capital. Now a deposit is no longer, just a deposit, but there is also a possibility for the deposit to be converted into bank's equity.

The above information presents part of the information for a rational economic agent who has decided to place a large deposit with the bank. However it is all the information we need for the analysis in this paper.

If the bank has a possibility to convert a portion of deposits into equity, this from the perspective of financial derivatives implies the banks have a possibility to “purchase equity” so in essence we are dealing with a call option: right to buy. If the bank has the possibility to exercise the right, then by the nature of position taking in trading it has a long position in call option. On the other hand the depositor has a short position in call option. Depositors should request premium for this possibility to be included in the pricing of deposits. Also deposits should be forward looking and include possible problems with the economy.

3. The Black Sholes formula

Standard model for pricing options is the Black-Scholes formula for options pricing based on models presented in Black and Scholes (1973) and Merton (1974). Excellent derivation and explanation of the Black Sholes formula can be found in Hull (2006). The mathematical representation of the formula is:

$$C = (S)(N(d_1)) - \left(\frac{K}{e^{rt}}\right)(N(d_2))$$

$$d_1 = \frac{\ln\left(\frac{S}{K}\right) + [r + 0.5\sigma^2]t}{\sigma\sqrt{t}}; d_2 = \frac{\ln\left(\frac{S}{K}\right) + [r - 0.5\sigma^2]t}{\sigma\sqrt{t}}$$

Where each of the symbols has the following notation C is the price of a call option, S is the current price of an asset, K is the strike price, e is base of natural logarithm, r is the risk free interest rate, t is time until the option expiration in years, N(d) is the normal probability distribution. Parameter σ is the volatility used which can be both historical and implied volatility, based on the approach to calculation.

In our case we are going to use the following parameterization. The strike price will be equal to the current price, so the pricing will be done at the money. For the strike price and the current price we will use the interest rate on the deposits. The rates have been taken from the web sites of the five largest banks in Croatia. The time period will be the time period for the deposit depending on their time bucket. For the actual time the end of the bucket will be used. So a 3 – 6 months time bucket will be calculated as 6 months. Risk free interest rate will be the rate of government T-bills with equivalent maturity as the time of deposits. For volatility we are going to use implied volatility derived from the credit rating's probability of default. The probability of default is taken from the S&P capital IQ report on sovereign rating and the probability of default was 22%⁷. This is a forward looking probability of default. Based on Fitch ratings the probability of default should be smaller, but since we are dealing with forward looking agents we have to look at the implied, not historical volatility.

4. Deposit structure in Croatia

From Table 1 it is clear the banks do not price in credit rating or forward expectations regarding the stability of the banking sector. Using the Black – Sholes formula and specified parameterization the new term structure of retail interest rates should be:

⁷ Data taken from the S&P capital IQ report.

Table 2: Adjusted retail deposit interest rates for 5 largest banks in Croatia

BANK 1						
HRK	1-3 months	3 - 6 months	6 - 12 months	12 - 24 months	24 - 26 months	over 36 months
500 - 49999,99	1,59	2,19	2,60	3,11	3,34	3,80
50000 - 199999,99	1,64	2,24	2,71	3,22	3,51	3,91
200000 and more	1,69	2,35	2,76	3,33	3,57	4,03
EUR	1-3 months	3 - 6 months	6 - 12 months	12 - 24 months	24 - 26 months	over 36 months
500 - 4999,99	0,77	1,30	1,81	2,24	2,44	2,57
50000 - 24999,99	0,97	1,46	1,91	2,40	2,66	3,04
25000 and more	1,08	1,62	2,02	2,56	2,83	3,15
BANK 2						
KUNA	1-3 months	3 - 6 months	6 - 12 months	12 - 24 months	24 - 26 months	over 36 months
500 - 2500,99	1,95	2,50	2,97	3,49	3,74	3,86
2501 - 5000,99	1,95	2,50	2,97	3,49	3,74	3,86
5001 - 10000,99	1,95	2,50	2,97	3,49	3,74	3,86
10001 - 25000,99	2,05	2,61	3,08	3,60	3,97	4,09
25001 - 49999,99	2,05	2,61	3,08	3,60	3,97	4,09
over 50000	2,05	2,61	3,08	3,60	3,97	4,09
EUR	1-3 months	3 - 6 months	6 - 12 months	12 - 24 months	24 - 26 months	over 36 months
500 - 2500,99	0,92	1,67	2,02	2,51	2,83	2,92
2501 - 5000,99	0,92	1,67	2,02	2,56	2,89	2,98
5001 - 10000,99	1,08	1,82	2,13	2,62	2,95	3,04
10001 - 25000,99	1,08	1,82	2,23	2,67	3,00	3,10
25001 - 49999,99	1,13	1,88	2,34	2,73	3,06	3,15
over 50000	1,23	1,98	2,44	2,84	3,17	3,27
BANK 3						
HRK	1 months	3 months	6 months	12 months	24 months	36 - 60 months
from 9999,99	1,64	1,77	2,12	2,24	2,38	2,51
10000 - 49999	1,89	2,03	2,18	2,34	2,49	2,63
over 50000	2,00	2,14	2,28	2,45	2,61	3,91
EUR	1 months	3 months	6 months	12 months	24 months	36 months
from 2499	0,41	0,52	0,69	0,98	1,19	1,40
2500 DO 9999	0,77	0,89	1,06	1,36	1,59	1,81
over 10000	1,02	1,15	1,33	1,64	1,87	2,10
BANK 4						
HRK	1 months	over 3 months	over 6 months	12 months		
from 2000	1,84	2,50	3,08	3,54		
EUR	1 months	over 3 months	over 6 months	12 months	over 24 months	
1000 - 2500	0,82	1,72	1,96	2,51	2,72	
2500 - 5000	0,82	1,72	1,96	2,51	2,83	
5000 - 10000	1,02	1,72	2,07	2,56	2,83	
10000 - 25000	1,13	1,88	2,12	2,62	2,95	
25000 - 50000	1,13	1,88	2,18	2,73	3,06	
over 50000	1,13	1,88	2,23	2,73	3,06	
BANK 5						
HRK	1 months	over 3 months	over 6 months	12 months	24 months	
all amounts	2,05	2,61	3,19	3,60	4,08	
EUR	1 months	over 3 months	over 6 months	12 months	24 months	
do 9999,99	1,18	1,93	2,28	2,73	3,12	
10000 - 24999,99	1,23	1,98	2,34	2,78	3,17	
25000 - 49999	1,28	2,03	2,39	2,84	3,29	
over 50000	1,33	2,09	2,44	2,89	3,40	

Source: Author's calculation

This new term structure of interest rates includes the forward looking expectations regarding the state of the economy and the time premium for deposits. This increases the price of deposits, which is to be expected. Also using this model any further decrease in credit ratings also increases the implied volatility and further increases the interest rates.

Incorporating the options premium the interest rates on retail deposits now have standard term structure. What this model also implies is that is the existing economic conditions in Croatia further deteriorate the probability of default (implied volatility) should also increase thus increasing the price of deposits.

5. Conclusion

The pricing of retail deposits in Croatia does not include any premium for the state of the economy or the probability of country default. This paper uses a simple Black – Scholes model in order to incorporate these two problems into pricing of retail deposits. Using the Black – Scholes formula the time premium and country risk premium was included in the existing deposit structure. This adjustment has increased the price of deposits.

The model has used implied volatility so the increase in the price of deposits in the model also incorporated the expectations regarding the state of the economy. This gives the model a forward looking character, but it also indicates that any further deterioration in the economy and decrease in the country credit rating should also increase price of the retail deposits. In the future it will be interesting to see if decreasing economic conditions do lead to increase in the price of retail deposits.

Bibliography

Black, F. and Myron S. (1973) The Pricing of Options and Corporate Liabilities, Journal of Political Economy, Vol.81, No.3, 637-654.

Bo, L.; Ahmet E. K. and Greg M. G. (2007) Fitch Equity implied rating and probability of default model Quantitative research special report Fitch Solutions https://www.fitchratings.com/web_content/product/methodology/eir_methodology.pdf retrieved on 20th March 2014.

CNB Bank Bulletin (2013) number 26 August 2013

CNB Bulletin (2014) number 201 march 2014.

Deposit insurance act Narodne Novine numbers 177 2004, number 119 2008, number 153 2009, number 80 2013

European Commission Communication from the Commission (2013) *Assessment of action taken by Cyprus in response to the Council Recommendation of 16 May 2013 with a view to bringing an end to the situation of excessive government deficit* http://ec.europa.eu/economy_finance/economic_governance/sgp/pdf/30_edps/communication_to_the_council/2013-09-06_cy_communication_en.pdf retrieved on 20th March 2014.

European stability mechanism FAQ – Financial assistance for Cyprus <http://www.esm.europa.eu/pdf/FAQ%20on%20Cyprus%20130520132.pdf> , retrieved on 20th March 2014.

Gregurek M. and Vidaković N. (2013) Bankarsko poslovanje Effectus Visoka škola za financije i pravo 600 pages.

Hull, J. (2006) Futures and other derivatives 6th edition, Pearson Prentice Hall 789 pages

Merton, R. C., (1974) “On the Pricing of Corporate Debt: The Risk Structure of Interest Rates,” Journal of Finance, Vol. 29, No. 2, 449-470.

Reyngold, A. Ahmet E. K. and Greg M. G. (2007) “Fitch CDS Implied Ratings (CD-IR) Model”, Fitch Solutions https://www.fitchratings.com/web_content/product/methodology/cdsir_methodology.pdf retrieved on 20th March 2014.

S&P capital IQ (2014) Global Sovereign Debt - Credit Risk Report 4th Quarter 2013 <https://www.capitaliq.com/home/resource-center.aspx> retrieved on 20th March 2014.