Model Status / To –Do

Patricia 3/2014

(unordered list)

* Figure out how to separate out the IRB payment from the user payments for the purposes of applying the expected chance of default, and for the bank.
* Risk premium – figure out if this needs to be used differently in different parts of the calculations
  + Doesn’t apply to IRB payments, which is already a known issue. Should it apply to other things?
  + Is there any place where it is a problem? I don’t think so…
* LLR opportunity cost/cost of capital
  + \*\* make opportunity cost only apply to unused LLR funds (?)
  + Opp cost only calculated on unused portion of LLR funds
  + (4) Re-integrate gvt cost of capital for LLR – Figure out if cost of capital should apply and, if so, what it is.
    - [LLR – implement ability to oversize the LLR. [this sort of already exists, thru the difference between LPCR and chance of loss]
* *~~Plug zimring’s numbers into the model, see if it results in the same terms for the user~~*
  + *~~Probably a problem if it does~~*
  + ~~Could attempt to address mathematically if a 100% LLR would cost the same as an IRB for the same user terms.~~
  + ~~Would the balancing-out of LSR and LPCR result in the same size reserve for a given set of user terms?~~
* ~~Figure out how to implement bank risk preferences and/or value the uncertainty in default rate~~
  + ~~May be necessary for differentiating IRB from LLR~~
* Maybe make a new version of the model where cost to gvt is specified, or user terms are specified. Could make it easier to make the graph of LLR/IRB break-even.
* Housekeeping to-do: Make sure value of all variables is explained. Also, replace formulas with excel functions when possible, for clarity

**Graphics to-dos**

* Figure out how to calculate and/or graph the “break even” point for a LLR – when (at what gvt cost of capital) the cost to gvt for the LLR is the same as the cost to gvt for an IRB, delivering the same terms to the user.
  + Plot gvt ‘break even’ cost of capital against (LLR/expected loss)  
    - i.e ratio of the size of the reserve to the value of expected payout.
  + First question – holding social cost of capital constant, and assuming LLR=expected loss**, when does the cost of LLR = IRB?**
    - How will bank risk premia affect this issue?

**On the docket after chatting w Jeff**

* Render two graphs:
  + The current cost to gvt vs consumer interest rate graph, but without shaded ares – just with lines
    - Need to make liner model of the points
      * Should figure out why IRB points aren’t in a straight line
    - Figure out how to label point of intersection with LPCR(? Maybe not useful for just one line?)
  + The cost to gvt vs (interest rate w LLR – interest rate w IRB), so that positive y axis means LLR is preferred, negative is IRB. Show for different ranges of expected loss
    - Need to convert chance.full.loss to expected loss for the legend
    - Figure out how to shade area
    - Label y=0 point with LPCR value.
* Think about how to display relationship between LPCR and (consumer value/cost to government) graphically
  + \*\* Is the relationship of LPCR to government cost linear?
  + How to relate LPCR to IRB cost?
* Do sensitivity for risk premia

**Resolved Issues:**

* (2~~) Monthly vs annual interest rates, compounding~~
  + **~~Do discount rates compound, too???????~~**
* ~~(2.5) Write in code that limits the IRB to values that result in non-negative interest rates.~~
* ~~(1) Calculate the percent of value lost (different from the constant probability of default)~~
  + ~~4% expected loss != 4% chance of default over tenor of loans. Understand what the realistic parameter is for chance.full.loss… What is the expected loss if the chance of default is 4%?~~
* **~~Non-zero recovery at default~~**
  + **~~ISSUE: 40% recovery rate decreases interest rates DRAMATICALLY (by ~8%). This seems unrealistic.~~**
  + **~~Also results in very negative bank.NPV when there is an IRB (why?)~~**
* **~~Why is interest rate not risk free with LSR = 1?~~**
  + **~~Somehow a higher recovery rate is resulting inhigher interst rates. This is obviously wrong.~~**
  + **~~Also a higher LSR is resulting in a higher interest rate.~~**
  + ~~Risk free: EV.pmt =1~~
* **~~Also LSR value doesn’t appear to have an effect on interest rates or gvt reserve size or, really, anything…~~**fixed. Wasn’t referencing input matrix for LSR value
* LSR value was multiplied by the whole (1-nodefault)\*(1-recovery rate) expression**~~Why does recovery rate (0 vs 40 %) create a 7% interest rate difference in user/bank interest rate when LSR = 100%?~~**
  + ~~Doesn’t appear to depend on loan.loss…~~
  + ~~A 100% recovery rate does not result in a riskless loan. Interest.user>bank.hurdle.~~
  + ~~Recovery doesn’t appear to have an impact when LSR =0. This is all backwards~~

**Differences from switching to compounding interest/discount rates (results) from simple monthly rates (result1):**

> result1-results

eecost savings.yr ee.lifetime tenor bank.hurdle user.discount gvt.discount chance.full.loss recovery LPCR LSR

1 0 0 0 0 0 0 0 0 0 0 0

2 0 0 0 0 0 0 0 0 0 0 0

3 0 0 0 0 0 0 0 0 0 0 0

4 0 0 0 0 0 0 0 0 0 0 0

5 0 0 0 0 0 0 0 0 0 0 0

6 0 0 0 0 0 0 0 0 0 0 0

7 0 0 0 0 0 0 0 0 0 0 0

8 0 0 0 0 0 0 0 0 0 0 0

9 0 0 0 0 0 0 0 0 0 0 0

10 0 0 0 0 0 0 0 0 0 0 0

11 0 0 0 0 0 0 0 0 0 0 0

12 0 0 0 0 0 0 0 0 0 0 0

13 0 0 0 0 0 0 0 0 0 0 0

14 0 0 0 0 0 0 0 0 0 0 0

15 0 0 0 0 0 0 0 0 0 0 0

16 0 0 0 0 0 0 0 0 0 0 0

interest.buydown upfront.rebate risk.adjust expected.loss.pct interest.user interest.bank loan.payment.user

1 0 0 0 0 0.9496 0.9496 7.5228

2 0 0 0 0 0.9698 0.9698 7.7493

3 0 0 0 0 0.9928 0.9928 8.0126

4 0 0 0 0 1.1103 1.1103 9.4048

5 0 0 0 0 0.9426 0.9426 7.4449

6 0 0 0 0 0.9467 0.9467 7.4899

7 0 0 0 0 0.9514 0.9514 7.5423

8 0 0 0 0 0.9756 0.9756 7.8145

9 0 0 0 0 0.9753 0.9753 7.7568

10 0 0 0 0 1.0543 1.0543 8.5269

11 0 0 0 0 1.1470 1.1470 9.4532

12 0 0 0 0 1.6087 1.6087 14.3272

13 0 0 0 0 0.9478 0.9478 7.4915

14 0 0 0 0 0.9635 0.9635 7.6425

15 0 0 0 0 0.9823 0.9823 7.8234

16 0 0 0 0 1.0771 1.0771 8.7515

loan.payment.bank simple.payback.yrs user.NPV bank.NPV gvt.cost.NPV gvt.reserve.size gvt.llr.oppcost buydown.cost

1 7.5228 0 -1.8764 0 0 0 NA 0

2 7.7493 0 -7.4685 0 0 0 NA 0

3 8.0126 0 -13.6030 0 0 0 NA 0

4 9.4048 0 -44.6702 0 0 0 NA 0

5 7.4449 0 0.0323 0 0 0 NA 0

6 7.4899 0 -1.0911 0 0 0 NA 0

7 7.5423 0 -2.3524 0 0 0 NA 0

8 7.8145 0 -9.0537 0 0 0 NA 0

9 7.7568 0 -12.7360 0 0 0 NA 0

10 8.5269 0 -43.8644 0 0 0 NA 0

11 9.4532 0 -81.3369 0 0 0 NA 0

12 14.3272 0 -281.9164 0 0 0 NA 0

13 7.4915 0 -2.1228 0 0 0 NA 0

14 7.6425 0 -8.1799 0 0 0 NA 0

15 7.8234 0 -15.4083 0 0 0 NA 0

16 8.7515 0 -52.9895 0 0 0 NA 0

> result1/results

eecost savings.yr ee.lifetime tenor bank.hurdle user.discount gvt.discount chance.full.loss recovery LPCR LSR

1 1 1 1 1 1 1 1 1 1 1 NaN

2 1 1 1 1 1 1 1 1 1 1 NaN

3 1 1 1 1 1 1 1 1 1 1 NaN

4 1 1 1 1 1 1 1 1 1 1 NaN

5 1 1 1 1 1 1 1 1 1 1 1

6 1 1 1 1 1 1 1 1 1 1 1

7 1 1 1 1 1 1 1 1 1 1 1

8 1 1 1 1 1 1 1 1 1 1 1

9 1 1 1 1 1 1 1 1 1 1 NaN

10 1 1 1 1 1 1 1 1 1 1 NaN

11 1 1 1 1 1 1 1 1 1 1 NaN

12 1 1 1 1 1 1 1 1 1 1 NaN

13 1 1 1 1 1 1 1 1 1 1 1

14 1 1 1 1 1 1 1 1 1 1 1

15 1 1 1 1 1 1 1 1 1 1 1

16 1 1 1 1 1 1 1 1 1 1 1

interest.buydown upfront.rebate risk.adjust expected.loss.pct interest.user interest.bank loan.payment.user

1 NaN NaN 1 1 1.066624 1.066624 1.036907

2 NaN NaN 1 1 1.065869 1.065869 1.037339

3 NaN NaN 1 1 1.064955 1.064955 1.037794

4 NaN NaN 1 1 1.060874 1.060874 1.039809

5 NaN NaN 1 1 1.066899 1.066899 1.036756

6 NaN NaN 1 1 1.066748 1.066748 1.036845

7 NaN NaN 1 1 1.066559 1.066559 1.036945

8 NaN NaN 1 1 1.065657 1.065657 1.037459

9 NaN NaN 1 1 1.067464 1.067464 1.037759

10 NaN NaN 1 1 1.068581 1.068581 1.040086

11 NaN NaN 1 1 1.069704 1.069704 1.042684

12 NaN NaN 1 1 1.074144 1.074144 1.053855

13 NaN NaN 1 1 1.067073 1.067073 1.036928

14 NaN NaN 1 1 1.067304 1.067304 1.037404

15 NaN NaN 1 1 1.067570 1.067570 1.037965

16 NaN NaN 1 1 1.068889 1.068889 1.040738

loan.payment.bank simple.payback.yrs user.NPV bank.NPV gvt.cost.NPV gvt.reserve.size gvt.llr.oppcost buydown.cost

1 1.036907 1 1.0006130 NaN NaN NaN NA NaN

2 1.037339 1 1.0022638 NaN NaN NaN NA NaN

3 1.037794 1 1.0037931 NaN NaN NaN NA NaN

4 1.039809 1 1.0086838 NaN NaN NaN NA NaN

5 1.036756 1 0.9999892 NaN 1 1 NA NaN

6 1.036845 1 1.0003606 NaN 1 1 NA NaN

7 1.036945 1 1.0007634 NaN 1 1 NA NaN

8 1.037459 1 1.0026879 NaN 1 1 NA NaN

9 1.037759 1 1.0040258 NaN NaN NaN NA NaN

10 1.040086 1 1.0120778 NaN NaN NaN NA NaN

11 1.042684 1 1.0193919 NaN NaN NaN NA NaN

12 1.053855 1 1.0399433 NaN NaN NaN NA NaN

13 1.036928 1 1.0007078 NaN 1 1 NA NaN

14 1.037404 1 1.0026452 NaN 1 1 NA NaN

15 1.037965 1 1.0048079 NaN 1 1 NA NaN

16 1.040738 1 1.0140661 NaN 1 1 NA NaN

**----------------------------------------**

**Should I make a new model?**

What would the new model be able to do?

* Set user terms OR set gvt cost
  + Better answer questions of what interventions could deliver subsidies more cheaply
* Otherwise all the same hurdles

**Major questions for the model**

* How to acknowledge the higher default risk from longer tenor?
* How to incorporate uncertainty in the expected value into the banks’ hurdle rate/risk premia
* Distinguish between subordinate debt (which earns returns) and LLR (which may not earn returns – and has an associated social cost of capital)