Structuring, Tranching and Financial Instability

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Introduction

- CDOs and the Crash maybe not a coincidence
- Paper is about selling loans into pools from primary to secondary market, and the special effects of tranching
- *Fragility* (discontinuous responses to continuous changes) is caused by agency costs and structuring and two equilibria
- Our model suggests that selling as a straight pool and selling as a structured deal are quite different and that the latter can lead to fragility and bank runs even if the former (with the same assets in the pool) cannot.

Summary

- Primary market (PM) sells to secondary market (SM) via putting loans into pools and shares in them
- PM knows loans loan-by-loan by but SM knows only the mean (Akerlof)
- But PM has holding costs or SM has liquidity—some sort of relative benefit to PM, so there can be sales
- Balance: PM sheds holding costs by selling (b per unit), but it loses agency cost (average cost minus marginal al cost of the last loan sold)
- SM has elastic supply at average cost
- So as PM dumps, agency cost goes up and dumping stops when they reach holding cost
- This is easy. Structuring is harder.
- Then we consider the same pool, but with tranching, and it can exhibit fragility

Dumping, Equilibrium and Marginal and Average Cost

Define average cost loan n as average of c(n) over all n loans given by

$$a(n) = \frac{1}{\mathrm{n}} \int_{0}^{n} c(k)dk$$

Marginal Agency Cost $A(n) = a(n) - c(n)$

Total Agency Cost

Seller Income

$$s(n) = \int_0^n ((a(\theta) - c(\theta))d\theta = \int_0^n (A(\theta)\, d\theta$$

$$y(n) = \int_0^n (s(k) - a(k)dk = \int_0^n b - (a(k) - c(k)dk$$

Value of a

Debt Tranche Share

$$v_d = \left((1 - e) - N^{-1} \int_{e}^{N} f(n, \sigma(n))ndn \right)$$

Dumping into pass-throughs

Figure 1 Equilibrium in Model 1 (Linear case)

This shows marginal (for seller) and average (for buyer) curves. Equilibrium comes from the balance between buyers (primary market) and sellers (secondary market), given lower holding costs (b) for the secondary market. The size of the pools in the secondary market is N, and the entire market is M

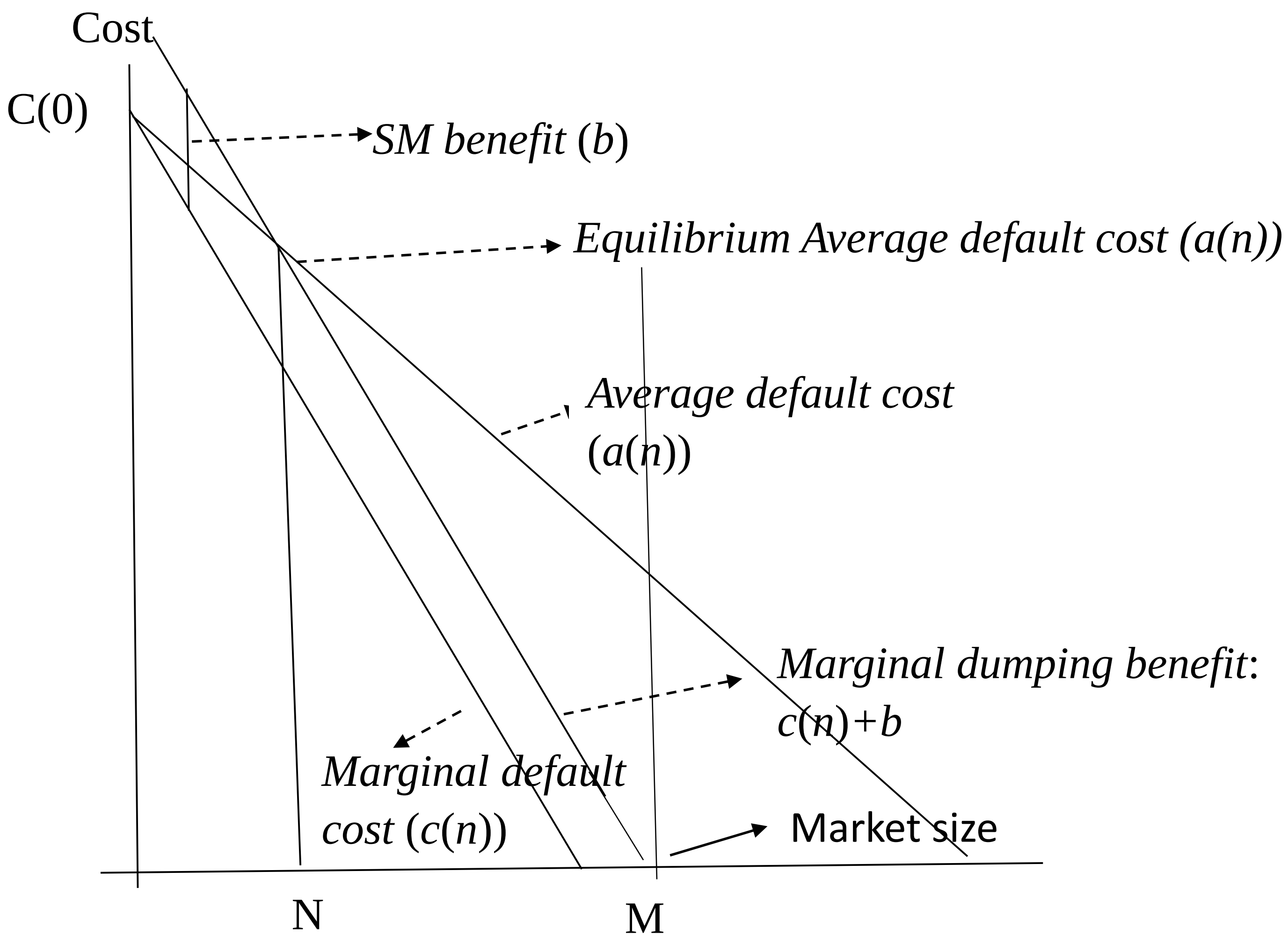
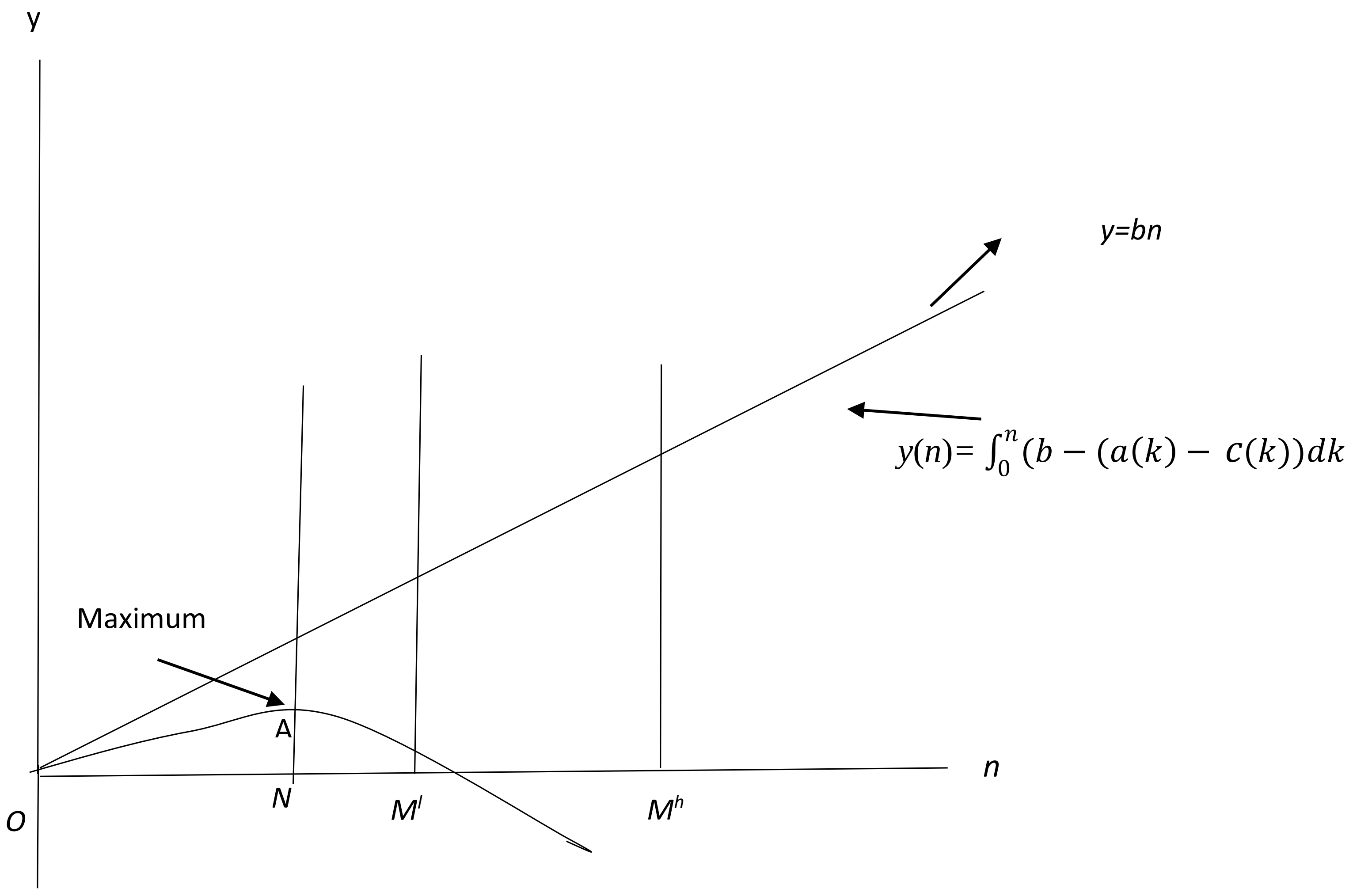


Figure 2. Model 1: Both Monopoly Pricing and Free Entry (Linear Case)

Seller income, y, as a function of Market Size. The line given by y(n) is income from PM sales, given b. The curve rises at first reaches a maximum and the falls below zero. The monopoly solution is at A, and the free entry solution is at B. If the market size is M^l then the market is smaller than "optimal." At M^l equilibrium is not constrained by market size.



Structuring

- Structuring can cause fragility by introducing debt-like pieces into the structure
- The balance between agency costs and holding cost changes at high volume levels
- This produces two types of equilibria, one at low market share for selling and one with 100% market share.
- Movements between the two produce fragility that can lead to the equivalent of bank runs

- $v_p = \left(1 - N^{-1} l \int_0^N\ f\big(n, \sigma(\rho n)\big) n dn\right) = (1 - p^* l$
- $v_d = \left((1-e) - N^{-1} \int_e^N\ f(n, \sigma(n)) n dn\right)$

  $=\big((1-e) - c(n)\big)$

- $c(n) = c(p(n)l\ , \sigma(n)) = plF(d(n)) + eF(d(n) - \sigma(n))$

- $c'(n) = -lF(d) < 0, c''(n) = -l\left[\frac{l}{\sigma} f(d)\right]$>0

- Optionality can produce two equilibria.
- The first is at low volume for the usual lemons type reasons, as agency costs increase until they equal holding cost.
- The other is at high volume due to optionality leading to an eventual decline in agency costs, as safer loans that are added to the pool being sold and loans become increasingly similar and easier to evaluate.
- This leads to a decline in agency costs, pushing market share to a corner solution, at 100% market share. Abrupt switches from low volume to high volume equilibria, and vice versa, are the source of the fragility. This can look like a bubble followed by a bank run.

Figure 3 Equilibrium in Model 2: View 1 (Nonlinear case): cost-pool size space

This is the same model as in Figure one, except that the marginal and average cost curves are non-linear and there can be a discontinuous shift in market share between buyers and sellers at some critical level of b, and the secondary market suddenly takes over the entire market.

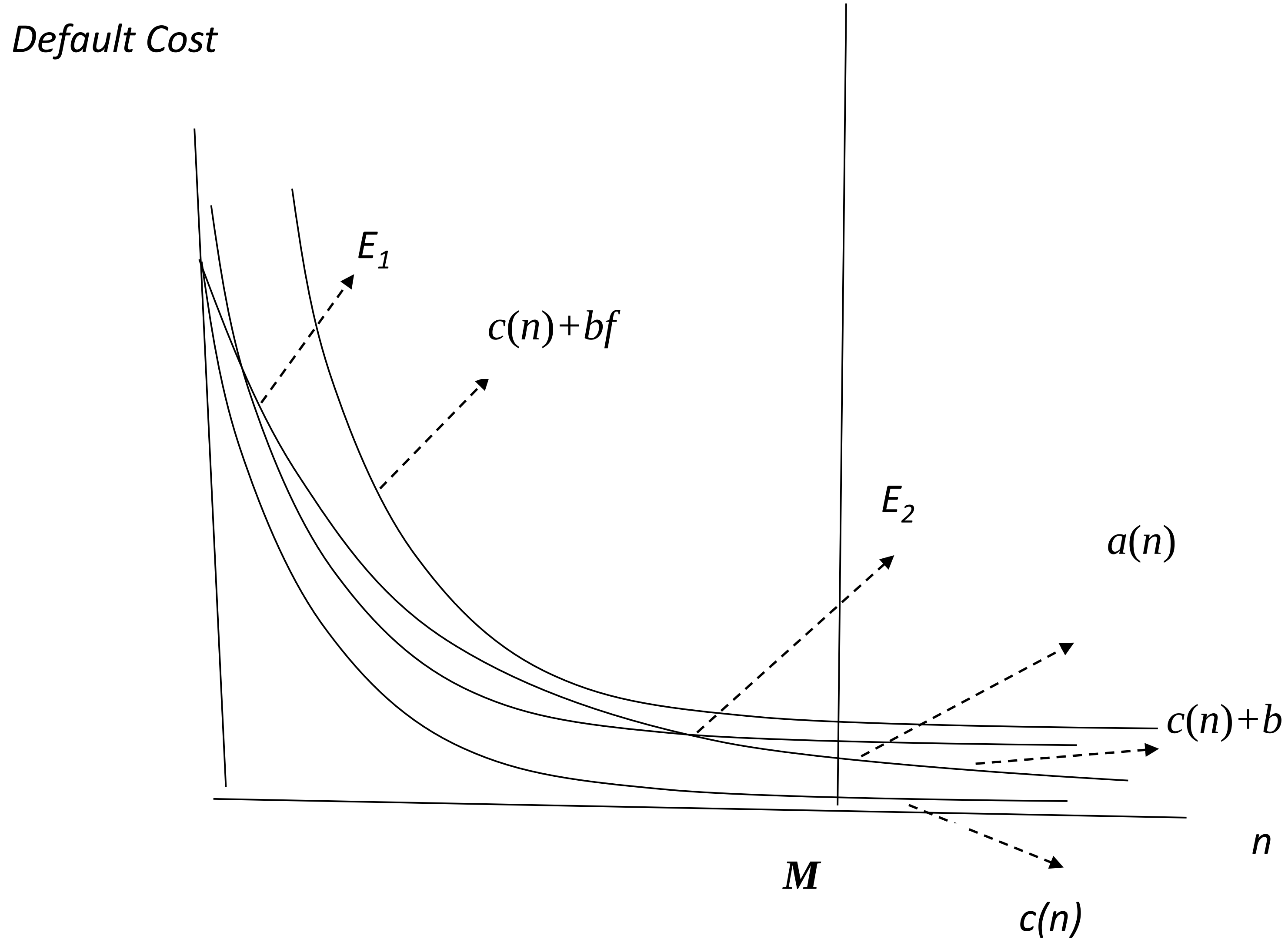


Figure 4: Equilibrium in Model 2: View in *b-n* space with y constant

This is the same picture as in Figure 2 except that it depicts agency cost *(A(n)* its intersection with *b*. It shows multiple solutions, which generate fragility. In particular at $b=b_1$, at point G a small increase in b will shift the equilibrium to H. Possible equilibria are along POG and HI. Above b* y is always positive

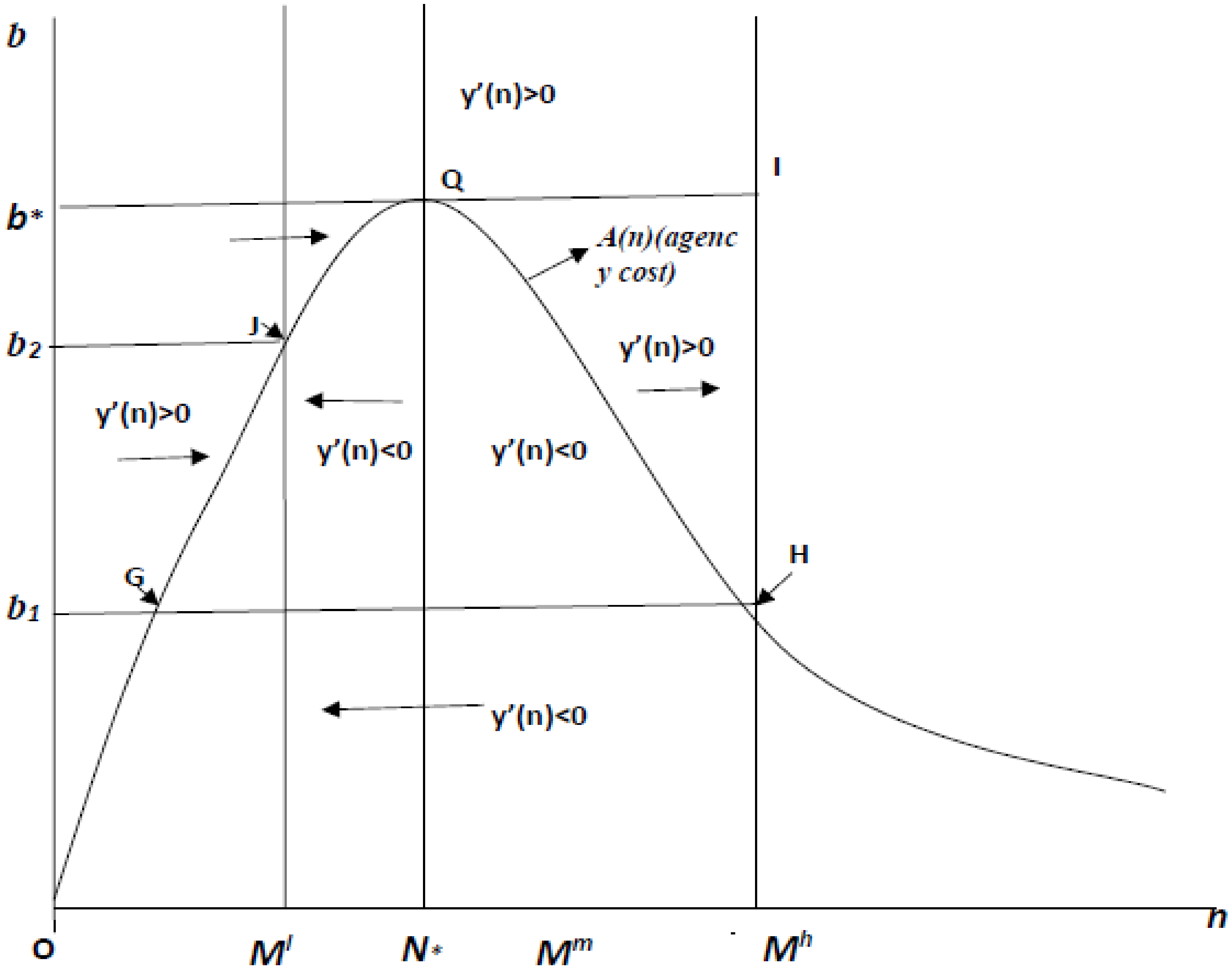


Figure 5: View in *y*-*n* space holding *b* constant

The curvy line depicts income, *y(n)*, from PM sales, given *b*. The curve rises at first a reaches maximum at A and the falls below zero, then reaches a minimum and rises again. y* is the value of y at the local maximum. Equilibrium can be along OA or BE, and there is a discrete move possible from A to B (and vice versa). A key property is that there is always a market size that is large enough for sellers to sell everything. D and E are switch points if equilibrium is characterized by zero net income.

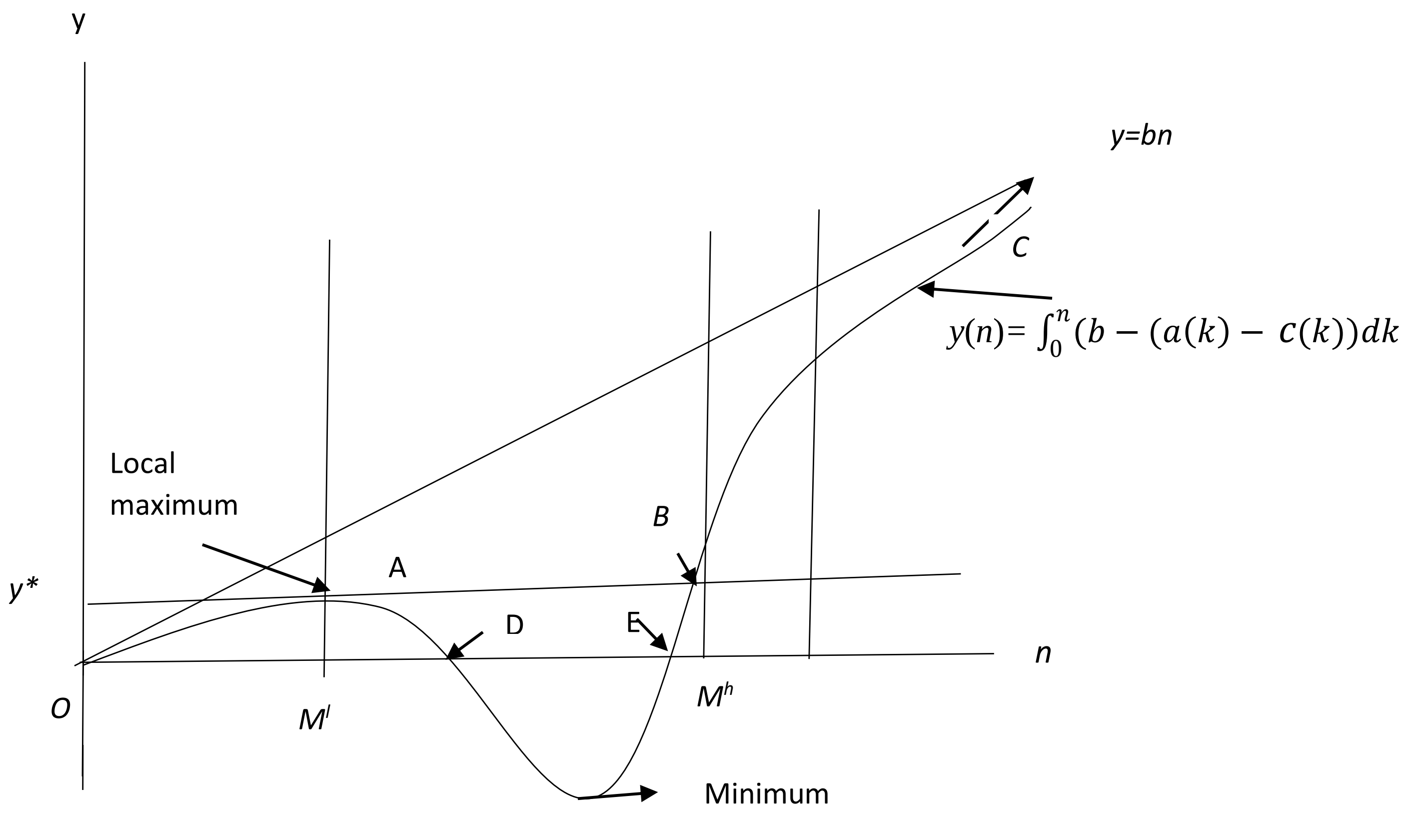
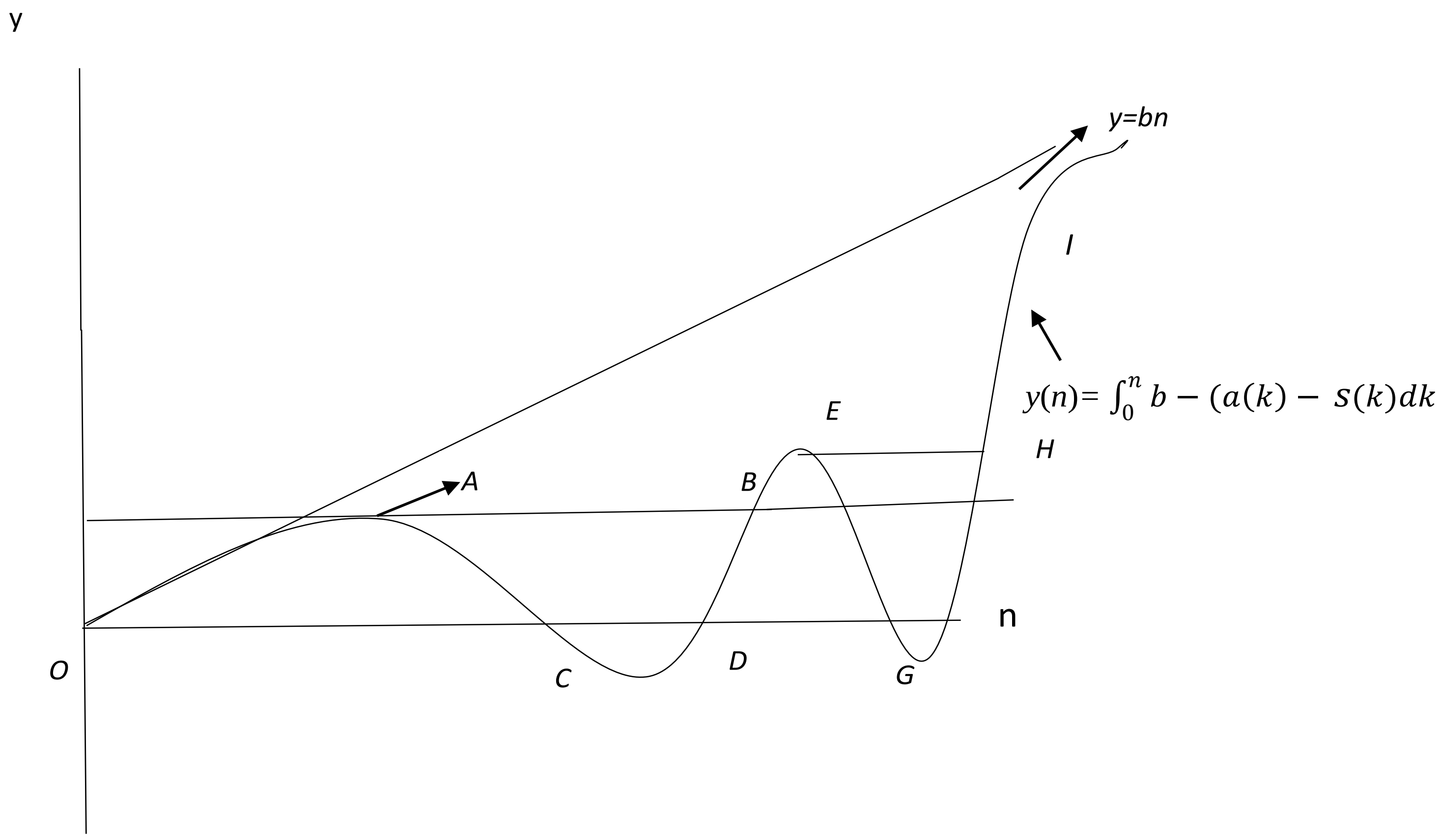


Figure 6. Equilibria with a Type of Nonlinear Distribution of Default Rates

This is the same as Figure 5 except that the distribution default probabilities in not linear, but rather has a peak on the middle. Equilibria can occur for markets of sizes along OA or- DE or HI two sets of tipping points. There are two discrete moves possible points, from A to B and E to H (and vice versa) so there can be an intermediate jump before taking over the entire market. As before there is always a market size large enough for fragility.



Conclusions

- Fragility can be due to structuring
- From optionality and debt tranches
- There is always a market big enough to make fragility a possibility