

# Beyond Underpants: Finance of space entrepreneurship

## Back to the future for Venture Banking

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$$\text{Asymptote} = \frac{1}{R}$$

$$m = \sum_{i=1}^n (1-R)^i$$

$m$  = money multiplier

$R$  = reserve ratio



# Who has reviewed what I will present?

Reviewed by:

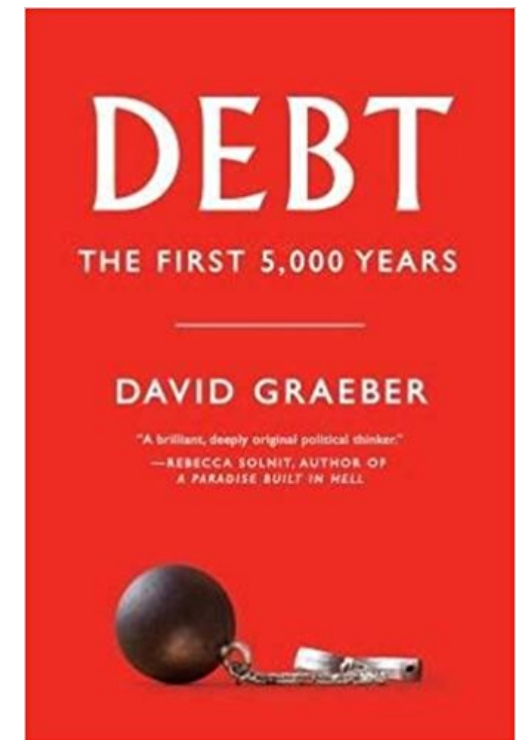
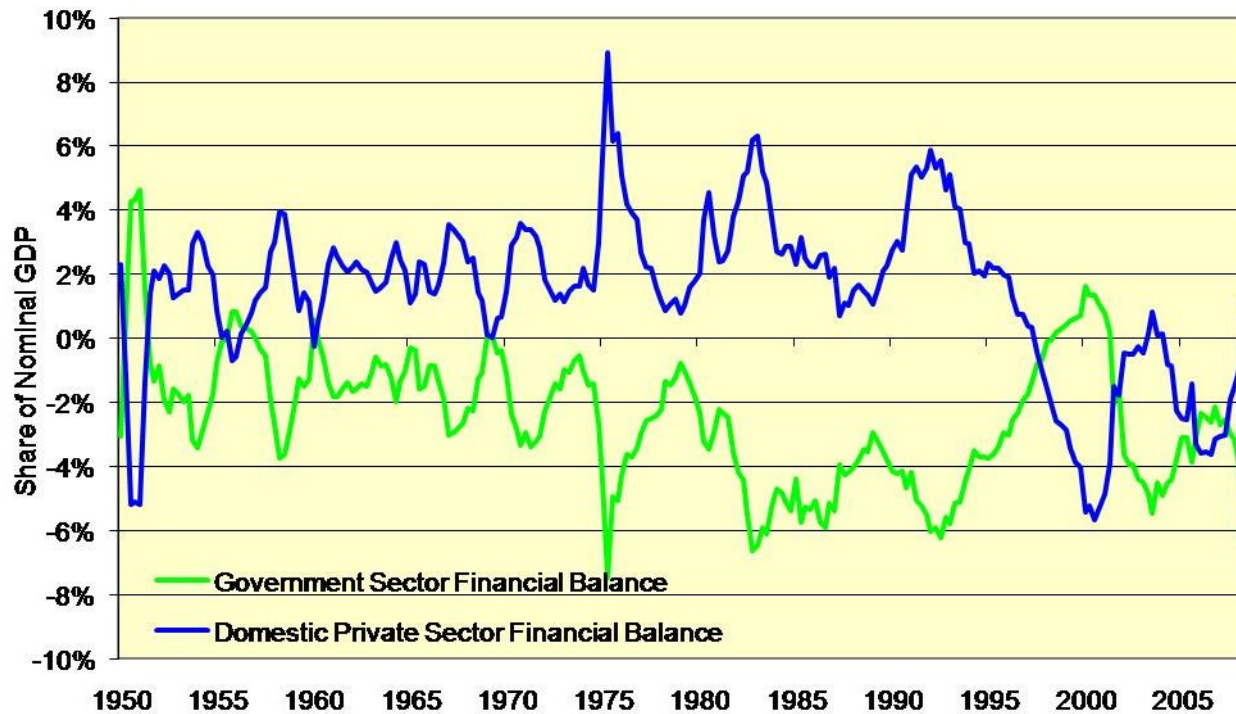
- **Kevin Walsh** - Dean's Executive Professor in Management at the Leavey School of Business
- **John Quiggin**, Laureate Fellow in Economics at the University of Queensland. (Endorsed publication.)
- **Steve Keen**, Researcher, Kingston University, London. (Endorsed publication.)
- **Geoffrey Gardiner**, author of, "The Evolution of Creditary Structures and Controls" (2006). Retired #2 at Barclays.

Original publication:

- Release of the Kraken: A Novel Money Multiplier Equation's Debut in 21st Century Banking. (2013) Economics. University of Kiel.

# Where does money come from? Debt

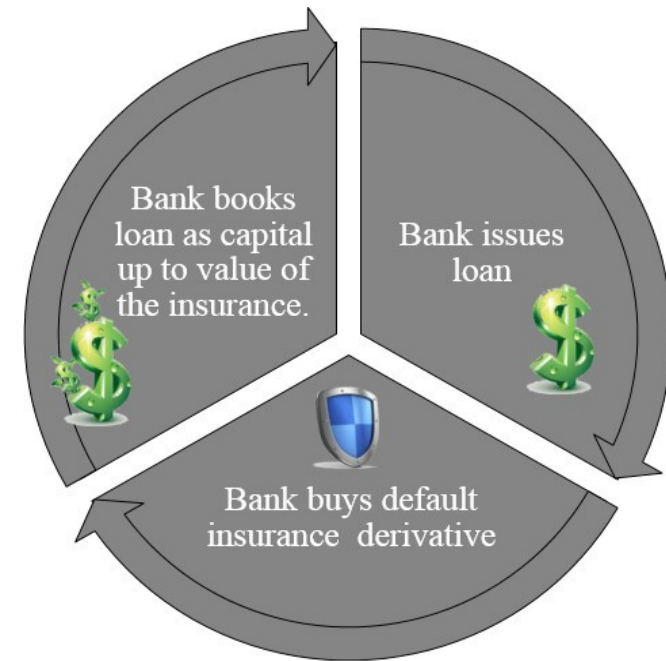
Sector Financial Balances (SFB) is an accounting identity, not theory. Disagreeing with it is akin to believing the earth is flat. - Scott Fulwiler



For every \$1 of credit balance there is \$1 of debt

# Identified an emergent phenomenon in banking

- Banks made loans (runup to 2008)
- Bought insurance (CDS\*) from AIG\*\*
- The insured asset (loan) can be used as capital (booked into capital account) as long as the insurance policy is current.



## Problems

1. Real estate rarely changes utility value at resale!
2. Jackpot perverse incentive. Banks sold loans, kept insurance & saw max profit = bad loan.

\* Credit Default Swap \*\* American International Group

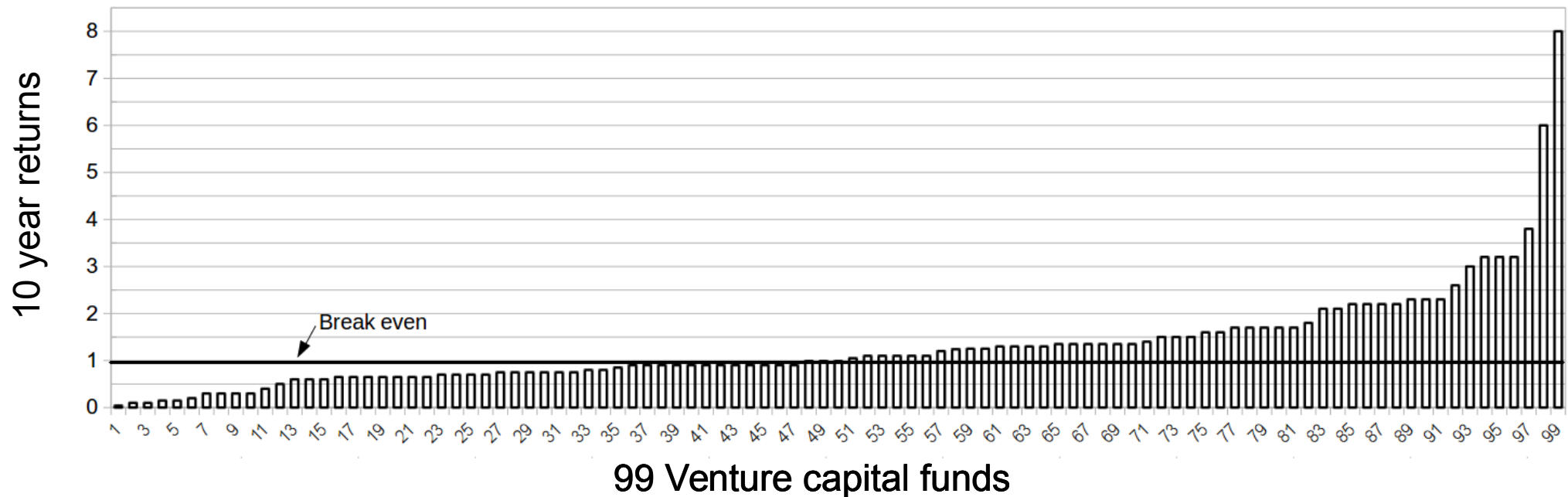
# Can a venture capital bank work this way?

## Venture capital fits - in theory

- ✓ New utility value is created in venture capital.
  - ✓ We price utility value in stocks, which creates money.
  - ✓ Banking has a general problem that deposits are short term and volatile, but investments are long term.
- 
- Can VC banks and insurers both profit?
  - Getting real world data for modeling is a problem.

# Data from Kauffman Fund's investments

Kauffman Fund's real world data on their Venture capital investments



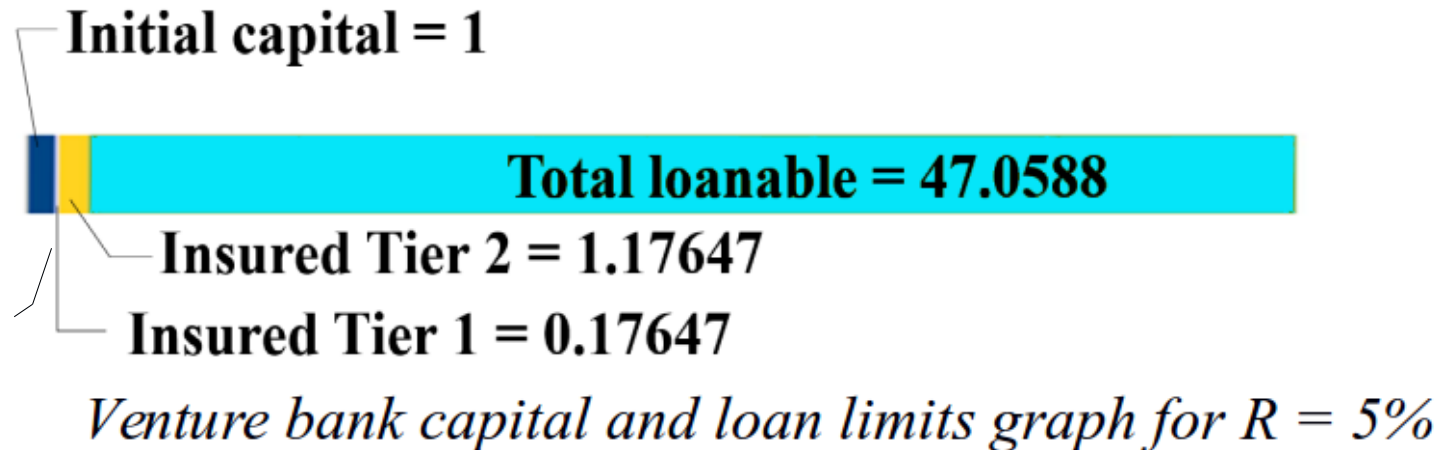
Kauffman Fund's portfolio of 99 VC portfolios of investments.

Mulcahy, et al. (2012) We Have Met the Enemy...and He is Us: Lessons from Twenty Years of the Kauffman Foundation's Investments in Venture Capital Funds and the Triumph of Hope Over Experience.

**Modeling results should hold for a large portfolio**

# Multiple of original capital (MOC)

Basel accords limit how much of a bank's capital can be insured assets.  
MOC is the maximum multiple of what investors seed bank with.



Reserves = Tier 1 + Tier 2

$$\frac{C}{0.85} = \text{Tier 1 limit} \rightarrow \frac{2C}{0.85} = \text{Capital reserves limit} \quad (2)$$

$$\frac{1}{R} \left( \frac{2C}{0.85} \right) = \text{Maximum loan limit} \quad (3)$$

Where:  $C$  = Initial capital,

$R$  = Reserve percentage.

Tier 2 capital paid off prior to Tier 1 in liquidation;  
15% of the Tier 1 and 100% of Tier 2 can be  
insured assets.

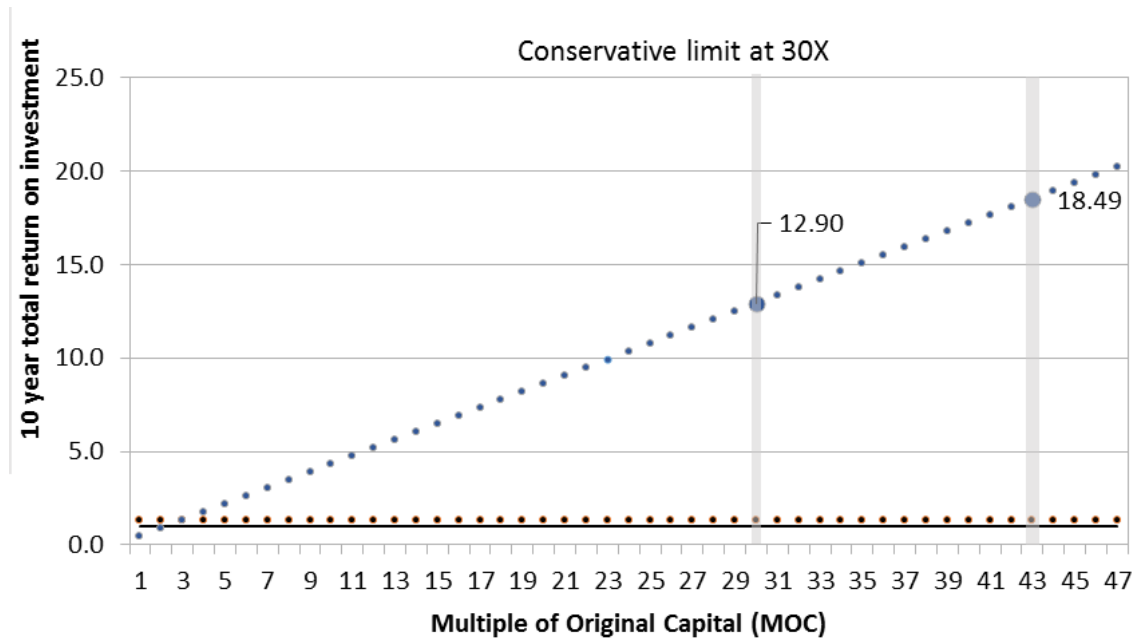
Tier 2 capital cannot exceed Tier 1 capital.

# Sample venture banking model results

Underwriter

DIN rate	Classical Portfolio return	DIN Underwriter investment (using year 5 as payout year)	DIN Under-writer 10 year earnings	DIN 10 year Net profit	DIN Under-writer 10 year return. (1.00 = break-even)	DIN Under-writer yearly return	DIN Equity fraction
5%	1.31	-8.43	50.14	41.71	5.95	19.52	50%

Venture bank



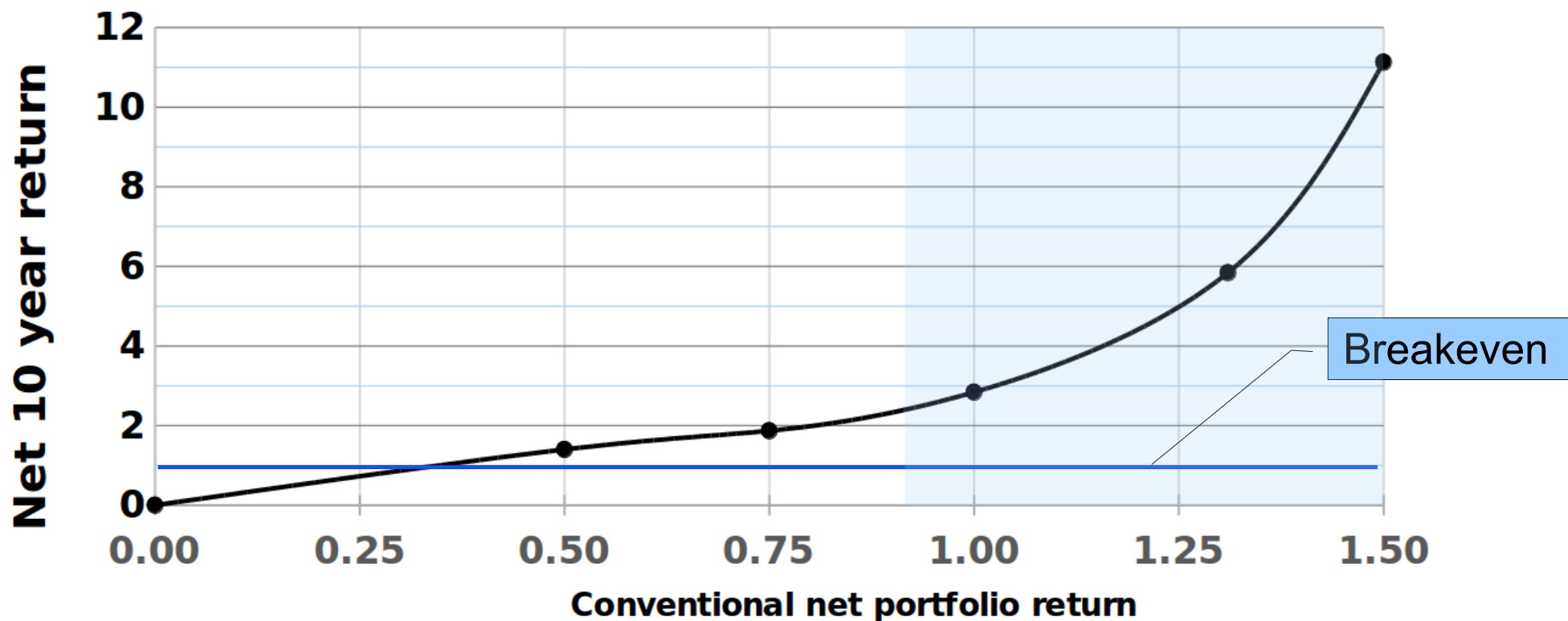
The underwriter spends \$8.43 to make \$50.14, for a profit of \$41.71, when VC portfolio returns 1.31X. Default insurance rate is 5% per year. The underwriter's equity fraction at exit is 50%. Venture bank makes 12.9X at an MOC of 30. Venture bank makes 18.49X at 43.



# Let's look at returns for underwriters.

DIN rate 5% per year, DIN equity share 50%, clawback lien rate 62.3%.

Light shading from 0.9 to 1.5 is the estimated normal range of conventional returns.

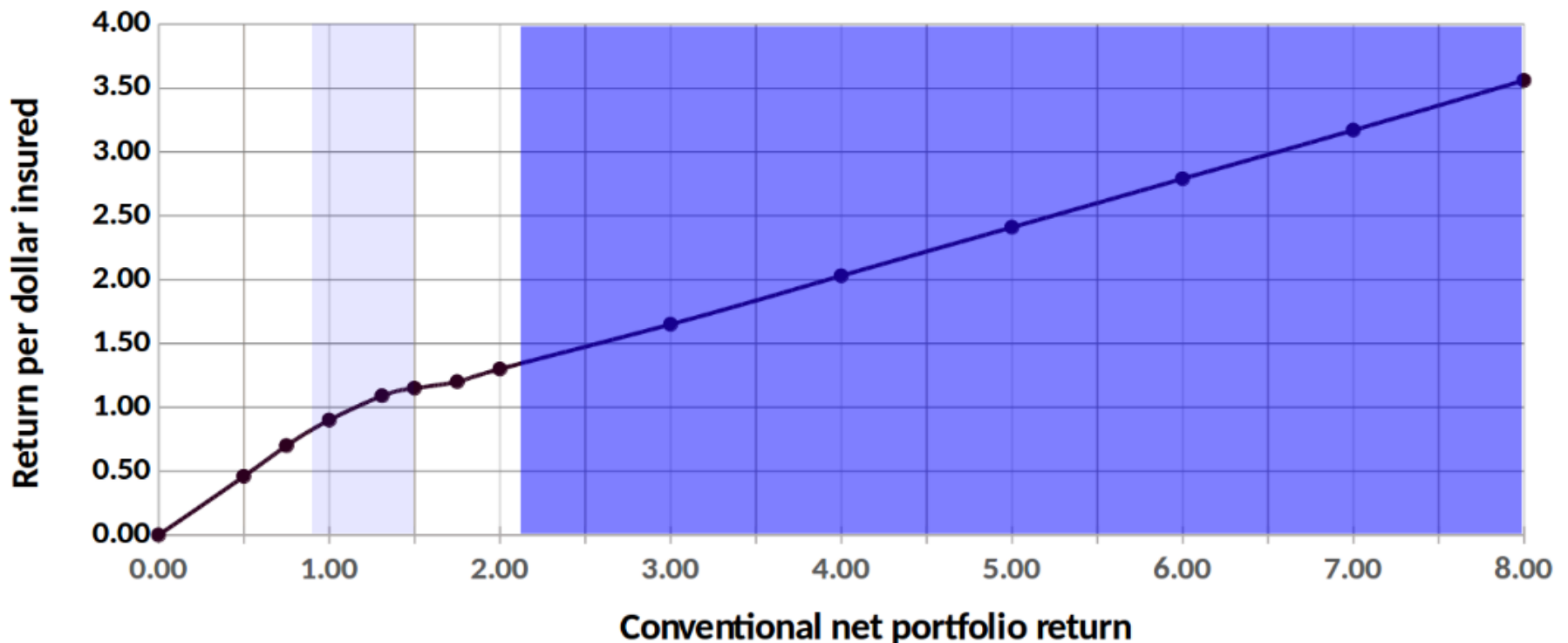


# Alternatively, underwriter return per dollar insured

DIN rate 5% per year, DIN equity share 50%, clawback lien rate 62.3%.

Light shading from 0.9 to 1.5 is the estimated normal range of conventional returns.

Dark shading from 2.27 and up is where underwriters have zero invested funds, and no net carrying costs. ROI here is meaningless.

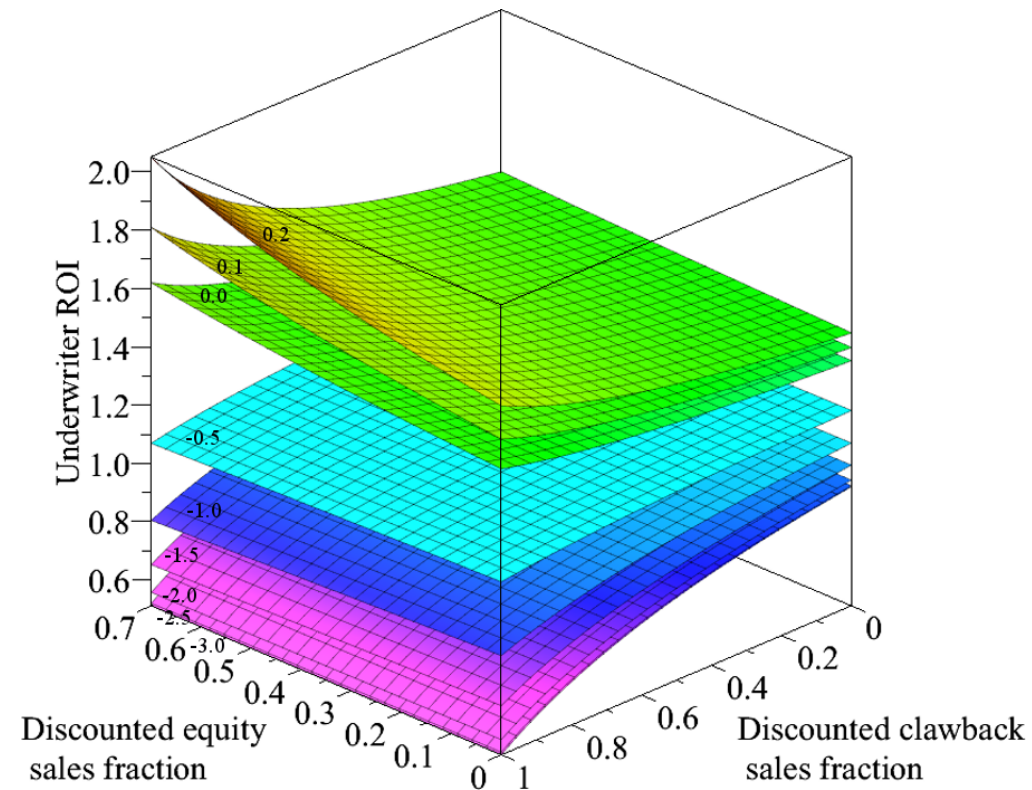
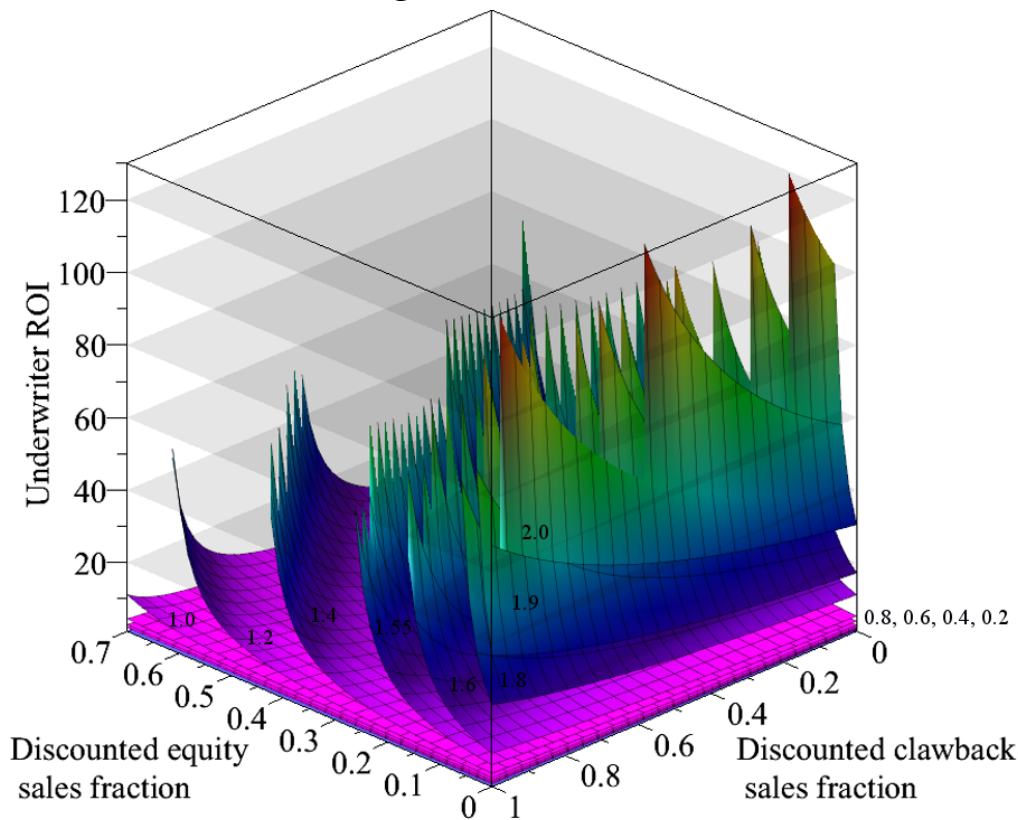


Here we start to see bumps in the graph. These are an effect of the clawback lien. Around 2, the clawback stops because no DIN insurance policies trigger.

# Underwriter returns phase space varying futures sales of equities and clawbacks.

DIN rate 5% per year, DIN equity share 50%, clawback lien rate 77%.

Where the graphs disappear, the cost goes to zero so ROI becomes meaningless.



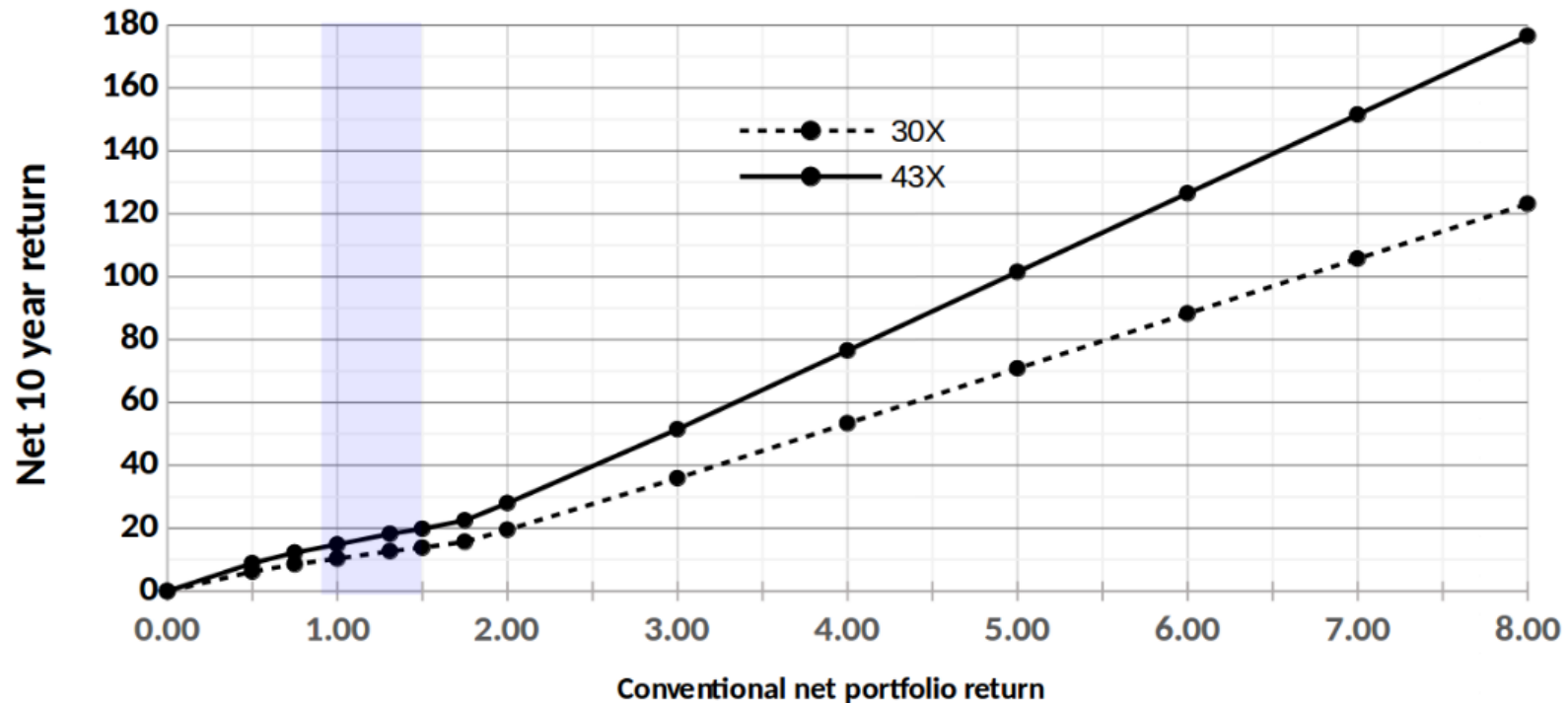
Each 3D graph is marked at a corner with its venture capital portfolio return. A value of 1.0 is a 10 year breakeven from the venture capital fund.

**Composite graphs. Left shows most common values. Right figure shows values corresponding to total loss and high loss levels.**

# Let's look at the same modeling for venture bankers

DIN rate 5% per year, DIN equity share 50%, clawback lien rate 62.3%.

Light shading from 0.9 to 1.5 is the estimated normal range of conventional returns.

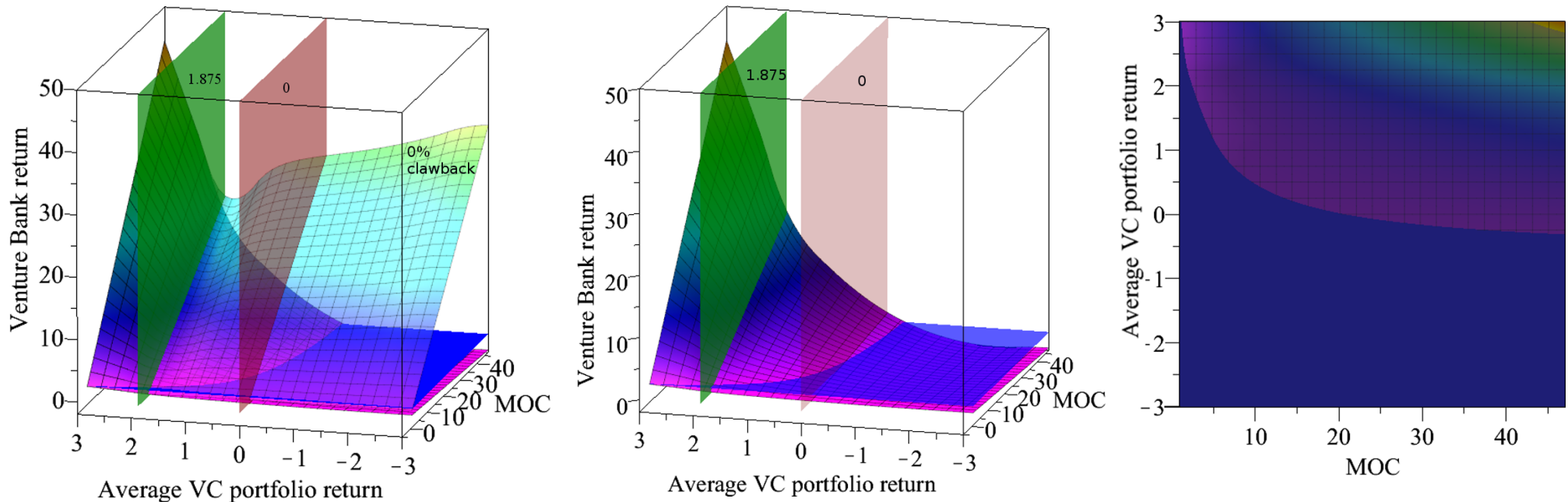


# Venture bank phase space

DIN rate 5% per year, DIN equity share 50%, clawback lien rate 77%. Planes at 1.875 and 0 show region of normal range of large portfolio returns.

Left graph shows an additional semi-transparent graph of returns without the clawback. No clawback creates an irresistible perverse incentive, because the low point of earnings for a venture bank is where the better large VC portfolios land.

Blue plane is breakeven, so this region shows losses for venture banks.



Center graph: 77% clawback. Right graph: Top view looking down the Z axis to show losses region clearly. Note: At the breakeven VC portfolio return of 1, and above, the scale is correct. At 0, the real VC portfolio return is 0.5 (50%). For technical reasons, -3.14 is a true total loss portfolio.

# How much Tier 1 capital is required to create \$1 trillion?

We'll assume reserves of 5%.

- Solve for C, or needed starting capital.

$$\frac{C}{0.85} = \text{Tier 1 limit} \rightarrow \frac{2C}{0.85} = \text{Capital reserves limit} \quad (2)$$

$$\frac{1}{R} \left( \frac{2C}{0.85} \right) = \text{Maximum loan limit} \quad (3)$$

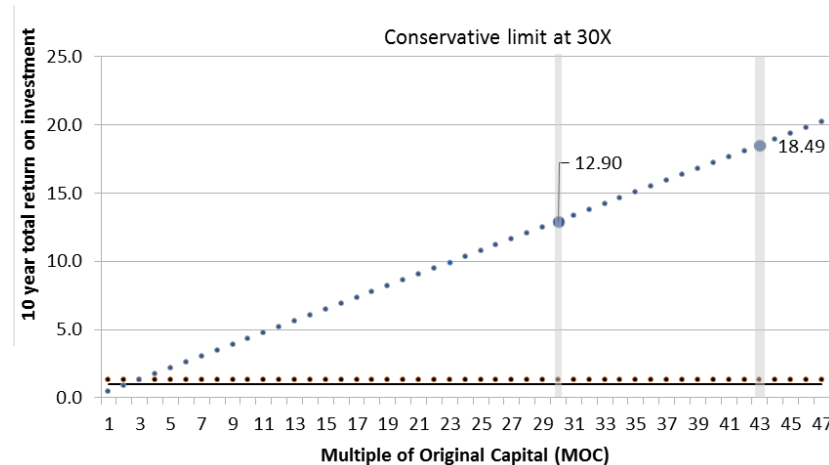
Where:  $C$  = Initial capital,

$R$  = Reserve percentage.

- \$21,250,000,000 or \$21.25 billion can create \$1 trillion

- Practically, must divide by  $^{30}/_{47}$  and  $^{43}/_{47}$ .

- \$33.29 billion with MOC of 30
- \$23.23 billion with MOC of 43



## Is that enough to build a colony?

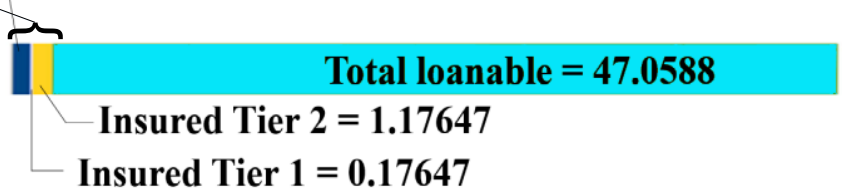
# Recap

- By harnessing the discovery of an accidental innovation in banking, we can create up to 47 times the base capital

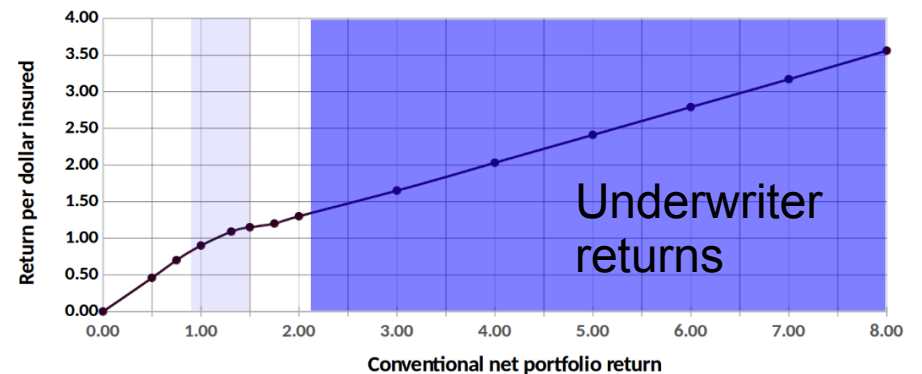
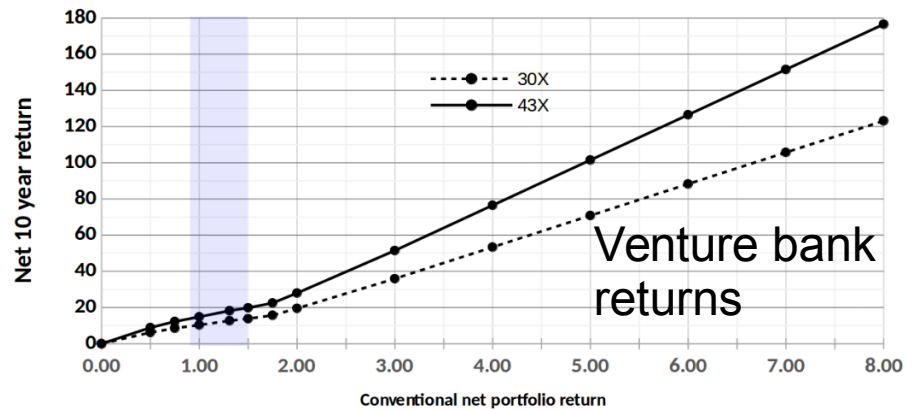
Reserves = Tier 1 + Tier 2

- Both the investor (venture bank) and the underwriter can make much higher returns than conventionally. Even dead average venture funds can make higher returns than the best current funds.

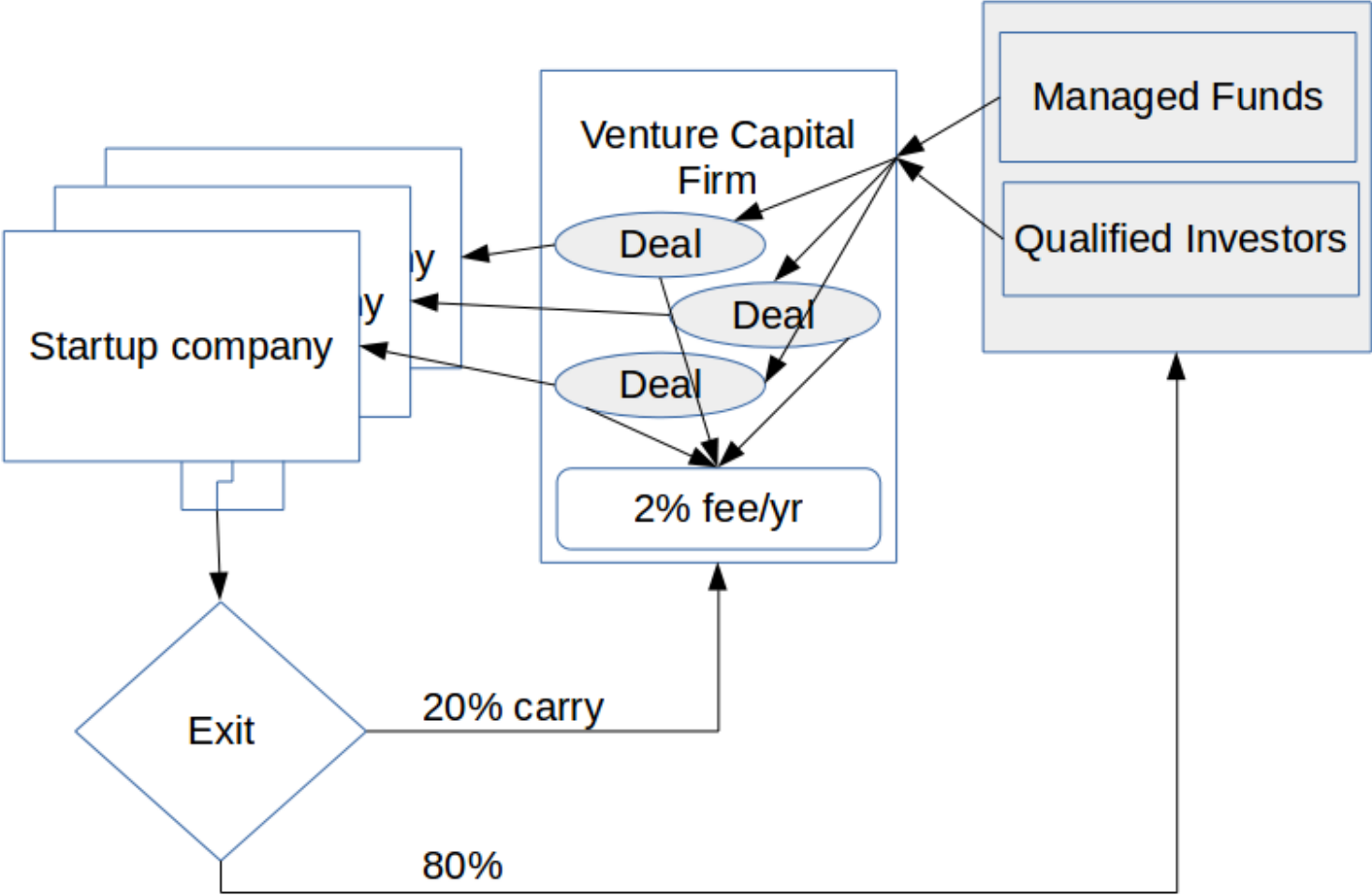
Initial capital = 1



Venture bank capital and loan limits graph for  $R = 5\%$

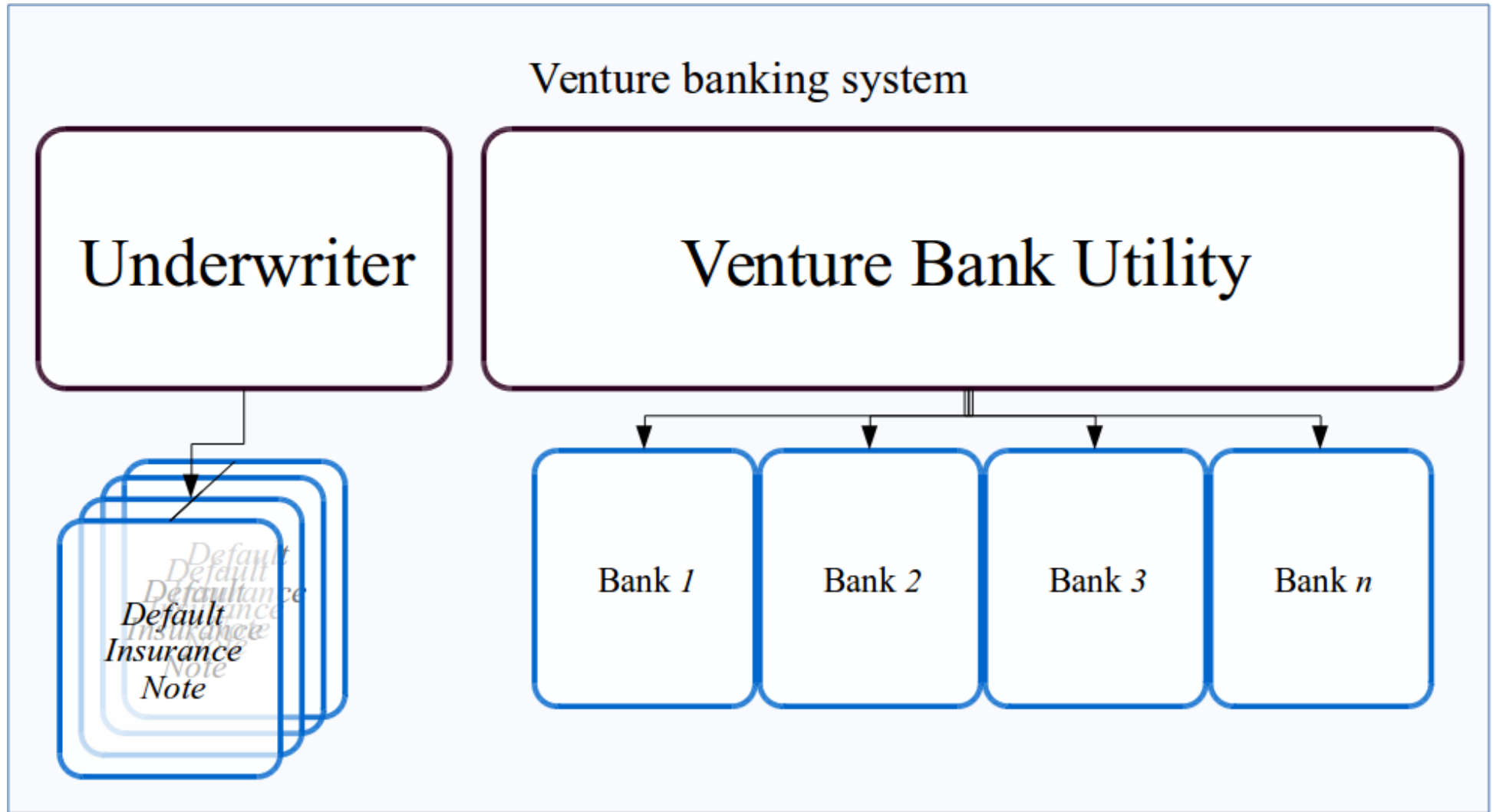


# How does venture capital work?





# Proposed venture banking system structure



# To delve further

There are 5 papers on the default insurance note mechanism in banking. The one that started this was in “Economics” in 2012. <http://www.economics-ejournal.org/economics/journalarticles/2012-3>.

The papers on venture banking followed.

1. <https://arxiv.org/abs/1707.08078> - Default Insurance Notes to Implement Venture Banking. (2017). I suggest to read sections '1 Introduction' and '2 Venture Banking' for concepts. Skim section '3 Venture Bank Modeling'. Skim section '4 DIN Contracts - Market Structure and operations', which I think it can be simplified. What is important in section 4 is that it contains my concept of how to sell underwriter side DIN equity futures to the public. Figure 16 diagrams the business structure. Figure 18 shows a superset of how the insurance works. Also read the short sections '5 Summary operation of DIN instruments', and '6 Audit of DIN instruments'.

Note: This paper was based on a spreadsheet model that is not accessible to readers.

2. <https://arxiv.org/abs/1810.00516> - A New Form of Banking - Concept and Mathematical Model of Venture Banking. (2018). This is paper goes over the calculus model computed in Maple. Read sections 'A Venture Bank builds a castle', 'Concept and walk through of Venture Banking system', and 'Simplified math walk through', first. Those are concepts. The mathematical model section has graphs for almost everything. You should be able to conceptually relate each graph to the equations. Pay particular attention to figure 4 which describes the Clawback lien. Then look at the 'Venture Bank system behavior' section. That has the 3 dimensional graphs that map the 'phase space'. However, this phase space has more dimensions due to parameters that can vary. There are 4 input parameter dimensions that could matter. This paper holds the DIN insurance premium and DIN equity fraction at 5% and 50% respectively.

Note: Maple worksheets are available.

# To delve further

3. <https://arxiv.org/abs/1711.02600> - The perverse incentive for insurance instruments that are derivatives: solving the jackpot problem with a clawback lien for default insurance notes. (2017).

This has the writeup for the clawback lien concept and modeling results. Without this, there is a perverse incentive to defraud the underwriter. What matters is that the clawback lien is crucial.

Without the clawback lien, the Venture Bank system will not work in the real world.

I broke this out for two reasons. First, paper #1 was just too long and unwieldy. Second, it has standalone significance because if AIG had been using it for home loans they wouldn't have crashed because:

A. AIG would have had a mechanism to implement a post-payment claims process to deal with fraud;

and/or

B. the perverse incentive to defraud AIG would have been eliminated.

MapleTM (2018) Maple 18. Maplesoft, a division of Waterloo Maple Inc., Waterloo, Ontario.  
[www.maplesoft.com](http://www.maplesoft.com)

# References

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<https://www.palgrave.com/us/book/9781403987532>
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<https://www.e-elgar.com/shop/an-introduction-to-macroeconomics> (I have chapter by chapter instructor notes for this book.)