A Bayesian Examination of Financial Constraints And Farm Investment

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Slide 1

A BAYESIAN EXAMINATION OF FINANCIAL CONSTRAINTS AND FARM INVESTMENT

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Slide 2

BACKGROUND

- Large literature exploring effect of financial constraints on firm investment
  - Seminal work by Fazzari, Hubbard, and Petersen (1988)
  - Recent review by Hubbard (1998)

Slide 3

Q MODEL OF (UNCONSTRAINED) INVESTMENT

$$Inv./K = \alpha_0 + \alpha_1 Q + error$$

Slide 4

Q MODEL OF FINANCIALLY CONSTRAINED INVESTMENT

$$Inv./K = \alpha_{0G} + \alpha_{1G} Q + \alpha_{2G} Liquidity + error$$

***G*: Financial market imperfection group**

Slide 5

EXAMPLE: Iowa, 1991-1998

Farm Type	*Q*	NCF	R^2
Low Equity	0.014 (0.065)	0.096 (0.014)	0.09
Middle Eq.	-0.019 (0.039)	0.1029 (0.0086)	0.24
High Equity	0.142 (0.063)	0.065 (0.018)	0.05

Slide 6

ISSUES

- ***Ad-Hoc* Sample Groups**
  - **Theory provides no guidance to separate groups according to probability of facing financial market imperfections ("sample selection bias")**

Slide 7

ISSUES

- Typically, firms separated into groups
  - But a firm's probability of facing financial market imperfections may change from one year to the next.

Slide 8

ADVOCATED SOLUTION

- "Invert" typical procedure using Bayesian approach:
  - Estimate 2 alternative investment regression models ("constrained" and "unconstrained"), letting each firm-year observation fall into either model
  - Calculate probability that each firm-year observation will fall into either model
  - Analyze characteristics of observations more likely to be "constrained" as opposed to "unconstrained"

Slide 9

ALTERNATIVE MODELS

Financially Unconstrained:

$$Inv./K = \alpha_{0U} + \alpha_{1U}\, Q + error_U$$

Financially Constrained:

$$Inv./K = \alpha_{0C} + \alpha_{1C}\, Q + \alpha_{2C}\, CA/K + error_C$$

Slide 10

ALTERNATIVE MODELS

- **Each firm-year observation assigned 50% *prior* probability of being unconstrained or constrained.**

Slide 11

DATA

- **Balanced panel of 366 Iowa farms from 1991 through 1998 (2196 farm-year observations).**

Slide 12

RESULTS

Financially <u>Unconstrained</u>:

$$Inv./K = 0.308 + 0.287\ Q + error_U$$

(0.252, 0.381) (0.146, 0.827)

StDev($error_U$) = 0.177

(0.149, 0.236)

Slide 13

RESULTS

Financially Constrained:

$$Inv./K = -0.011 + 0.089\ Q + 0.006\ CA/K + error_C$$

(-0.024, 0.005) (0.022, 0.257) (0.001, 0.011)

$$\text{StDev}(error_C) = 0.010$$

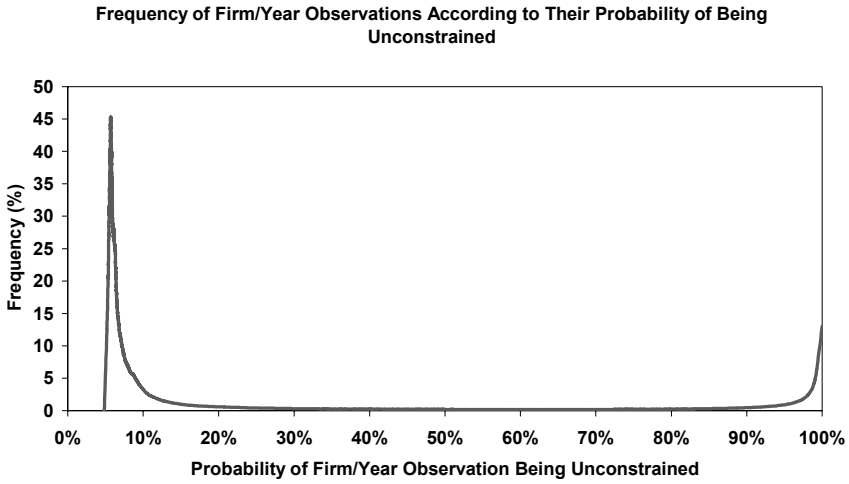
(0.008, 0.013)

Slide 14

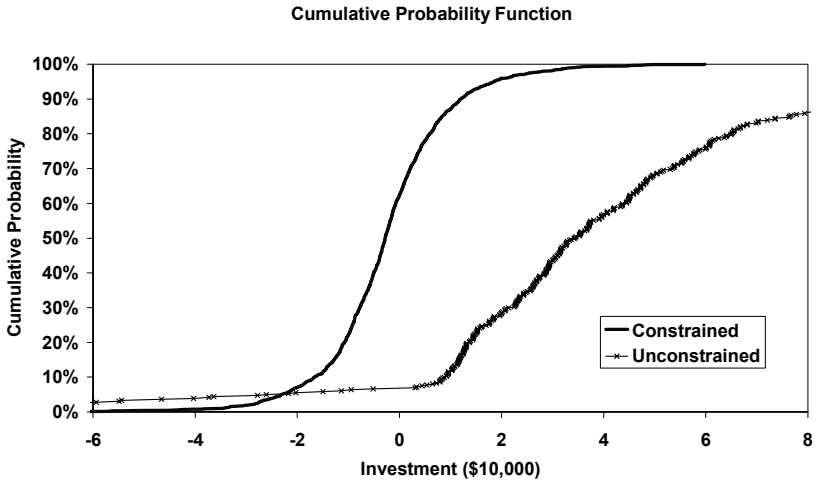
RESULTS

- **25.2% median posterior probability of being unconstrained**
- **74.8% median posterior probability of being constrained.**

Slide 15



Slide 16



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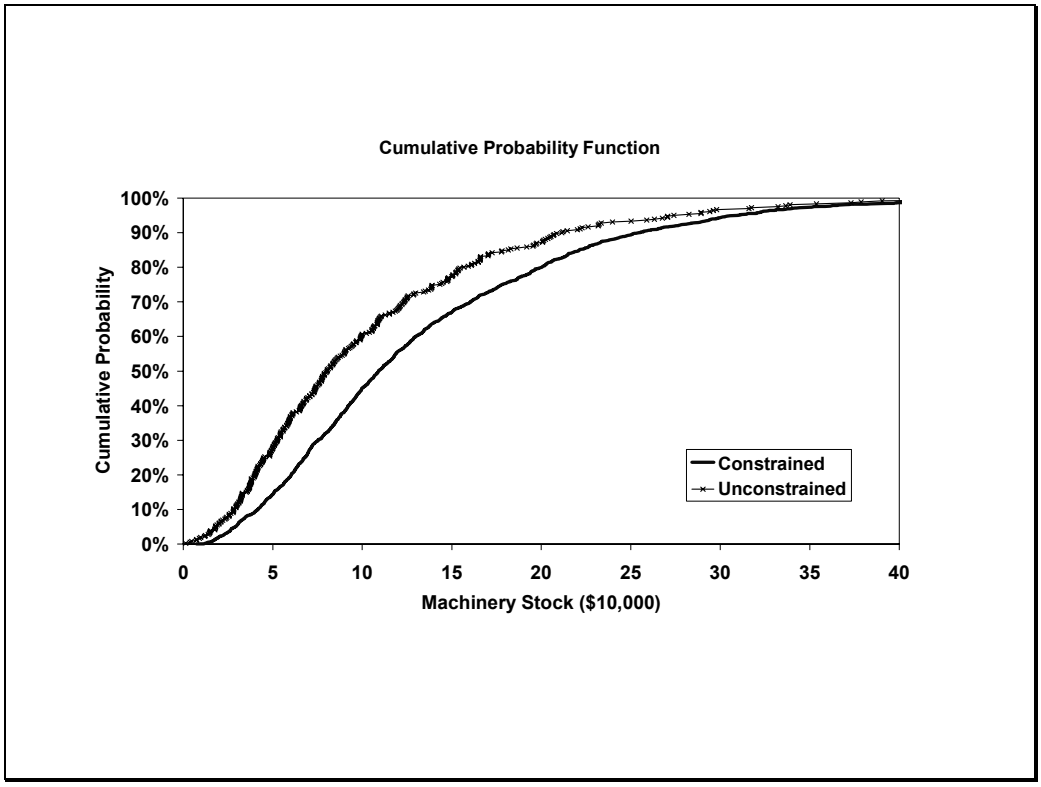

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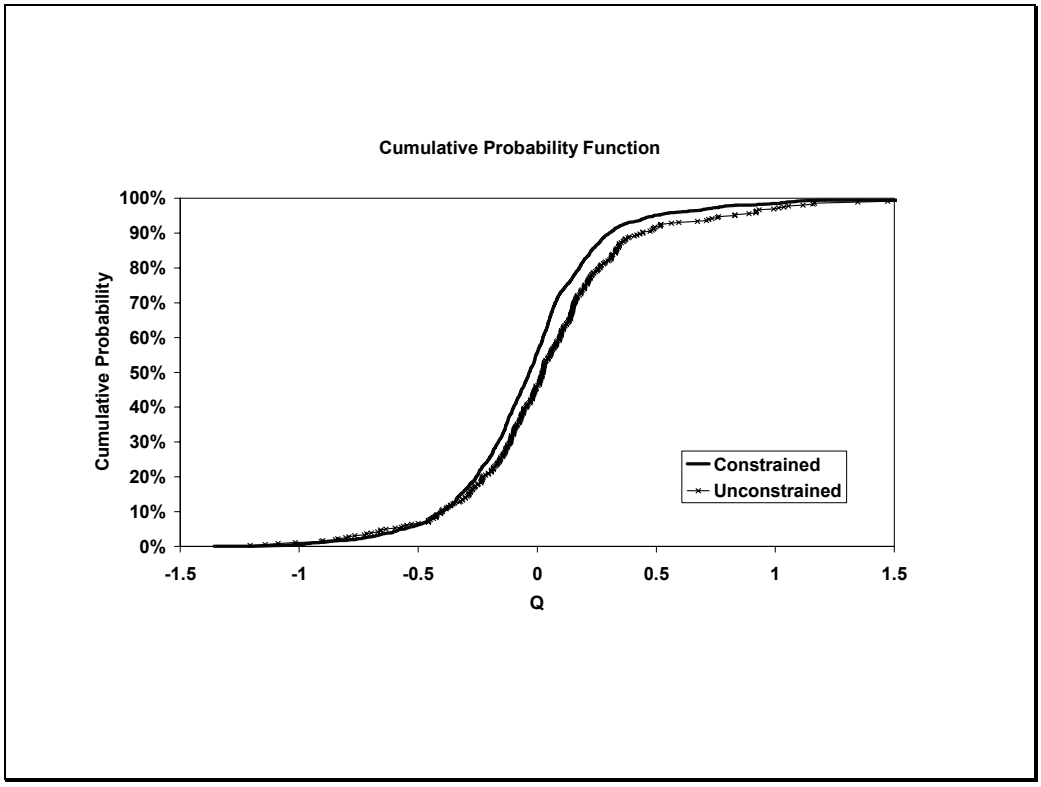

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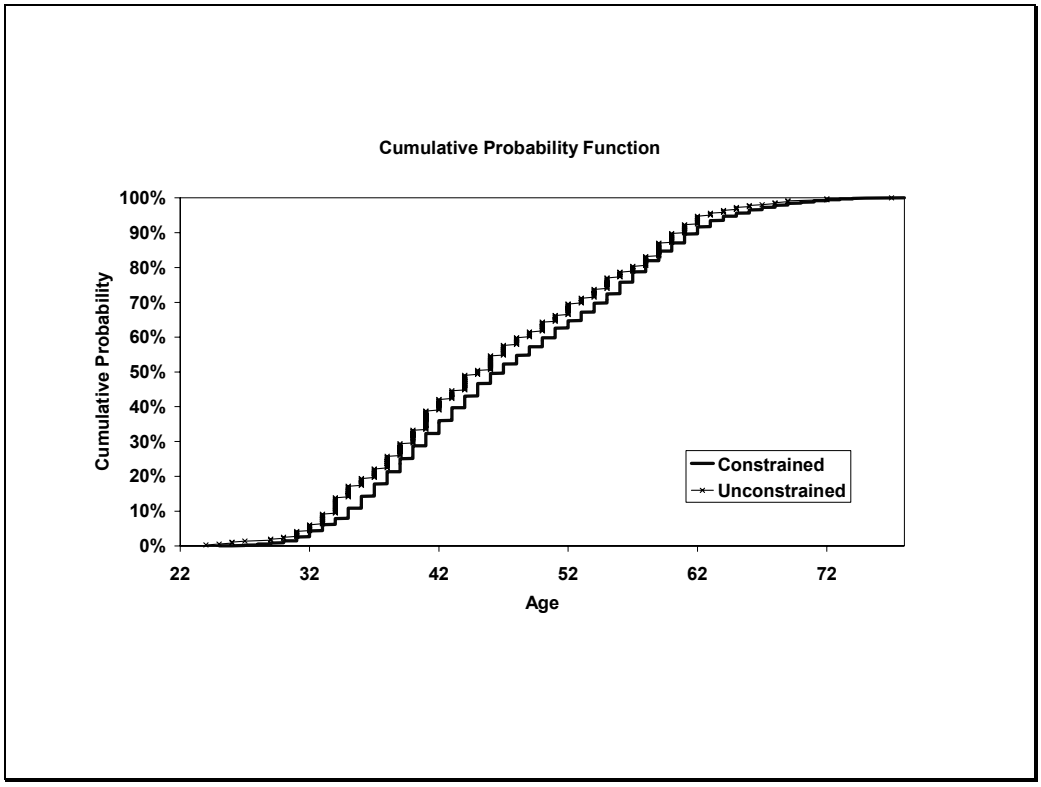

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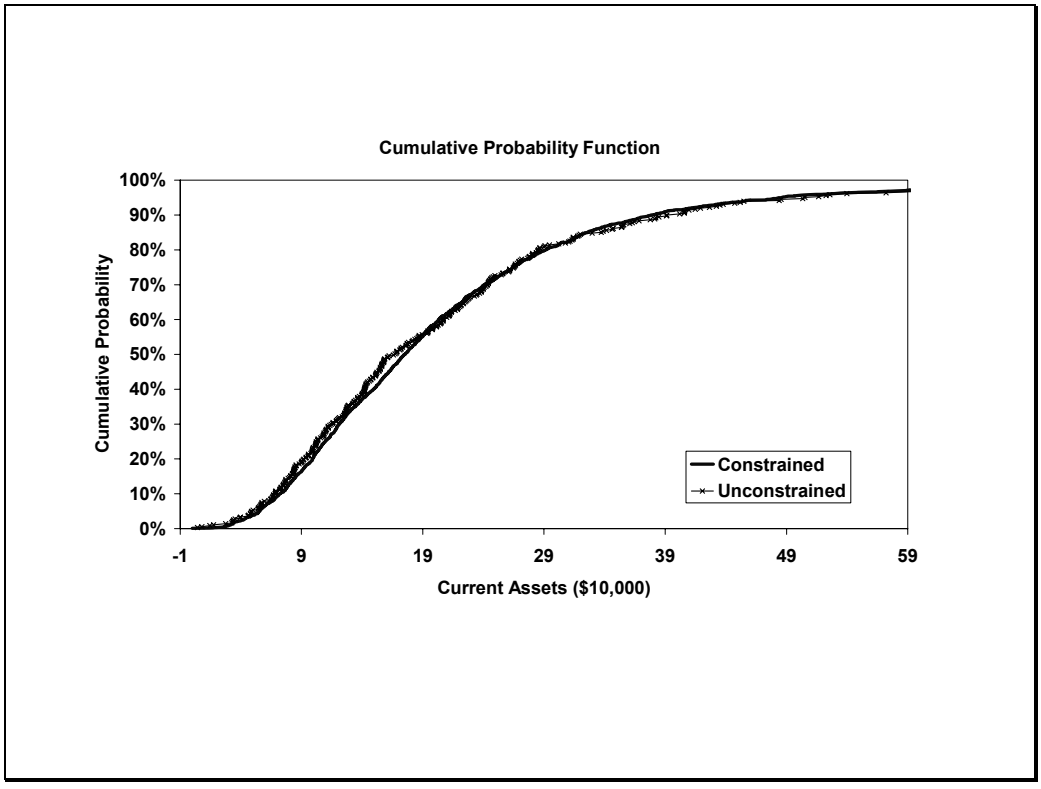

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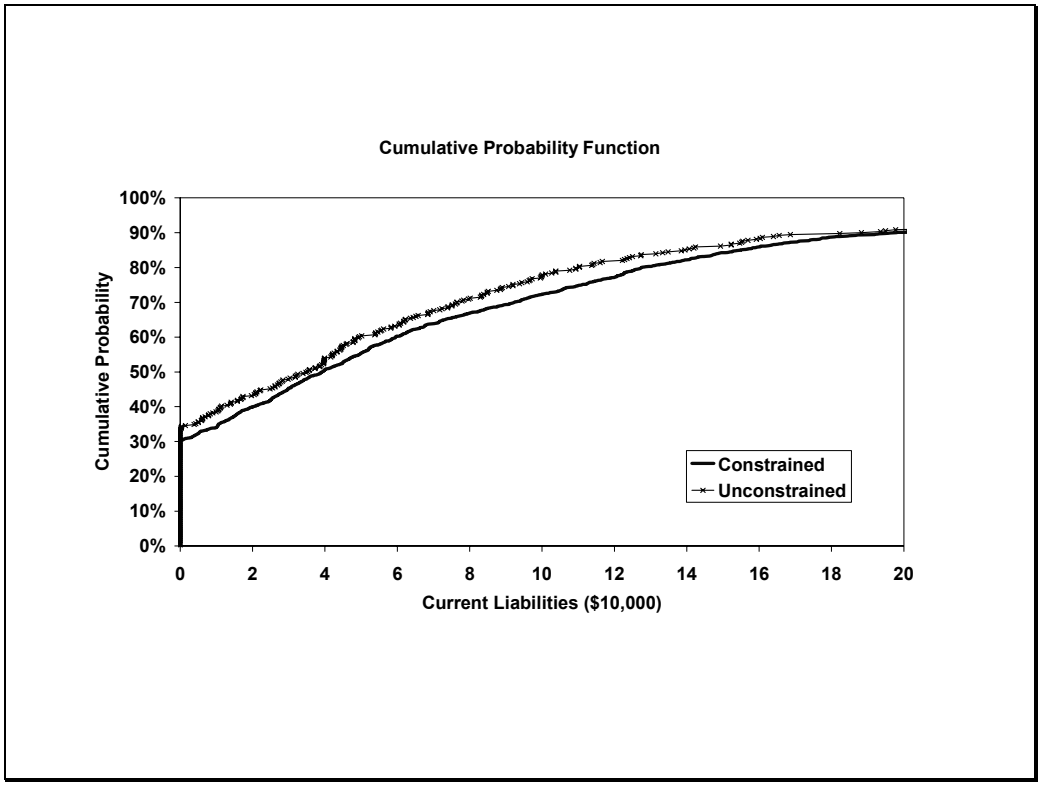

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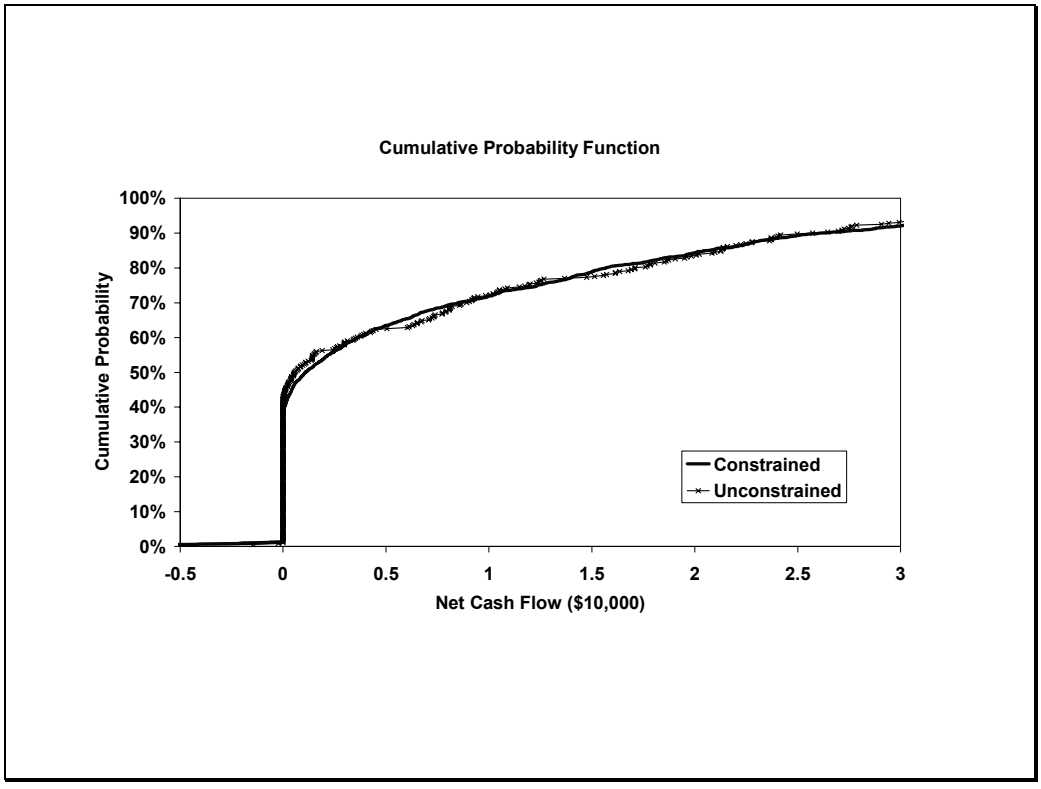

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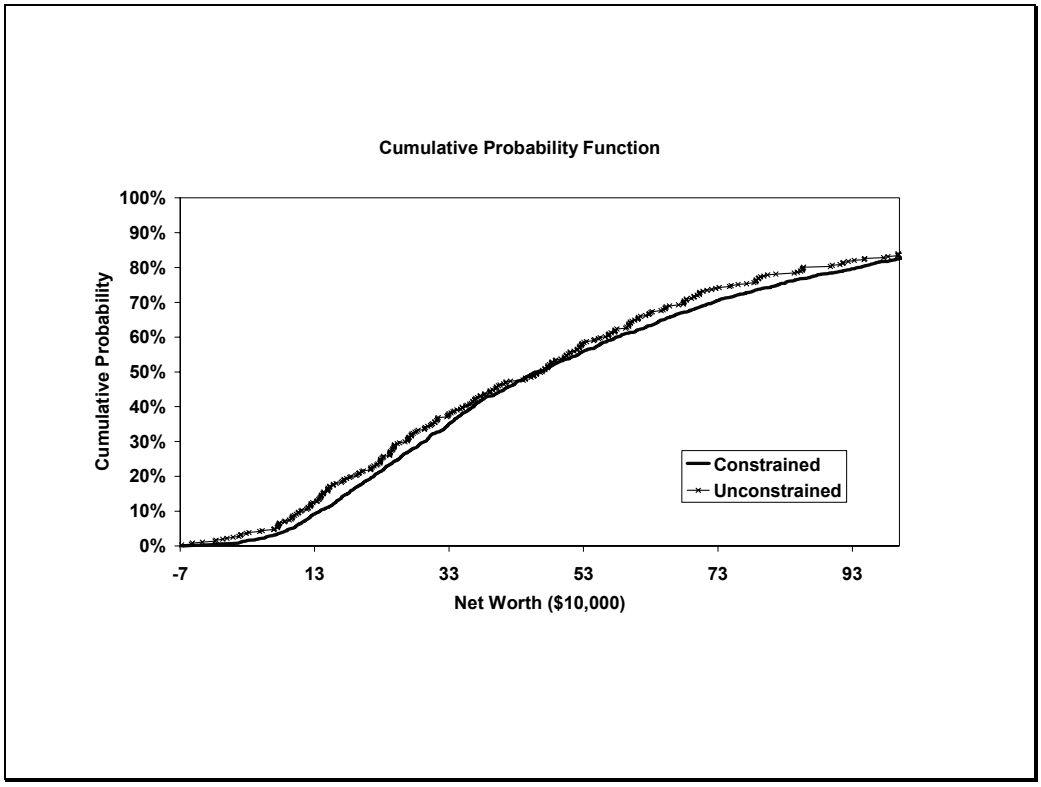

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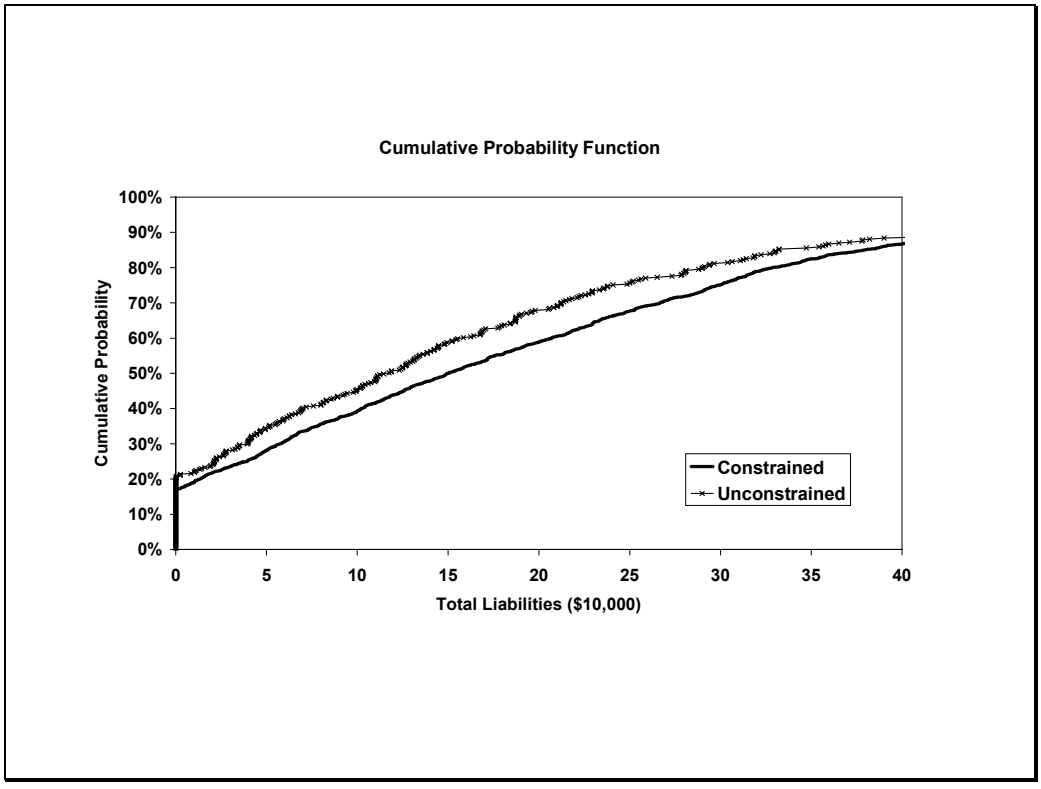

Slide 25

CONCLUSIONS

- **Bayesian analysis can be used to overcome sample selection problems**
- **Analysis of sample of Iowa farms over 10 years reveals that 75% of farm/year observations had some evidence of liquidity affecting investment (for a 50% prior)**

Slide 26

CONCLUSIONS

- **Firm/year observations more likely to be constrained display different:**
  - **Investment**
  - **Machinery**
  - **Q**
  - **Age?**
  - **Current Liabilities**
  - **Total Liabilities**

But similar:

- **CA**
- **NCF**