BANK OF ENGLAND

Measuring Financial Market Efficiency (and Stability): The Proof of the Pudding is in the Eating

Kevin R. James
CCBS, Bank of England
kevin.james@bankofengland.co.uk

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These are my own views, and do not necessarily represent those of the Bank of England.

kevin.james@bankofengland.co.uk

I. Rating Financial Systems

kevin.james@bankofengland.co.uk

Wanted: A Michelin Guide to Financial Systems

- As central bankers we contribute to the development of the financial system
- So, naturally, we want to know if (and how) financial market development affects the overall economy
- To do this, we need measures of financial market development
- We can then analyze the relationship between financial market development, economic performance, and regulatory policies

kevin.james@bankofengland.co.uk

The Current Approach: Quantity has a quality all its own

- The current approach measures financial market *development* by financial market *activity*
  - This approach was pioneered by King and Levine (1993)

- The standard measure of overall financial activity is Total Capitalization or TotCap, with TotCap equal to:

$$\frac{\text{Stock Market Cap} + \text{Private Sector Bank Credit} + \text{Corp Debt}}{\text{GDP}}$$

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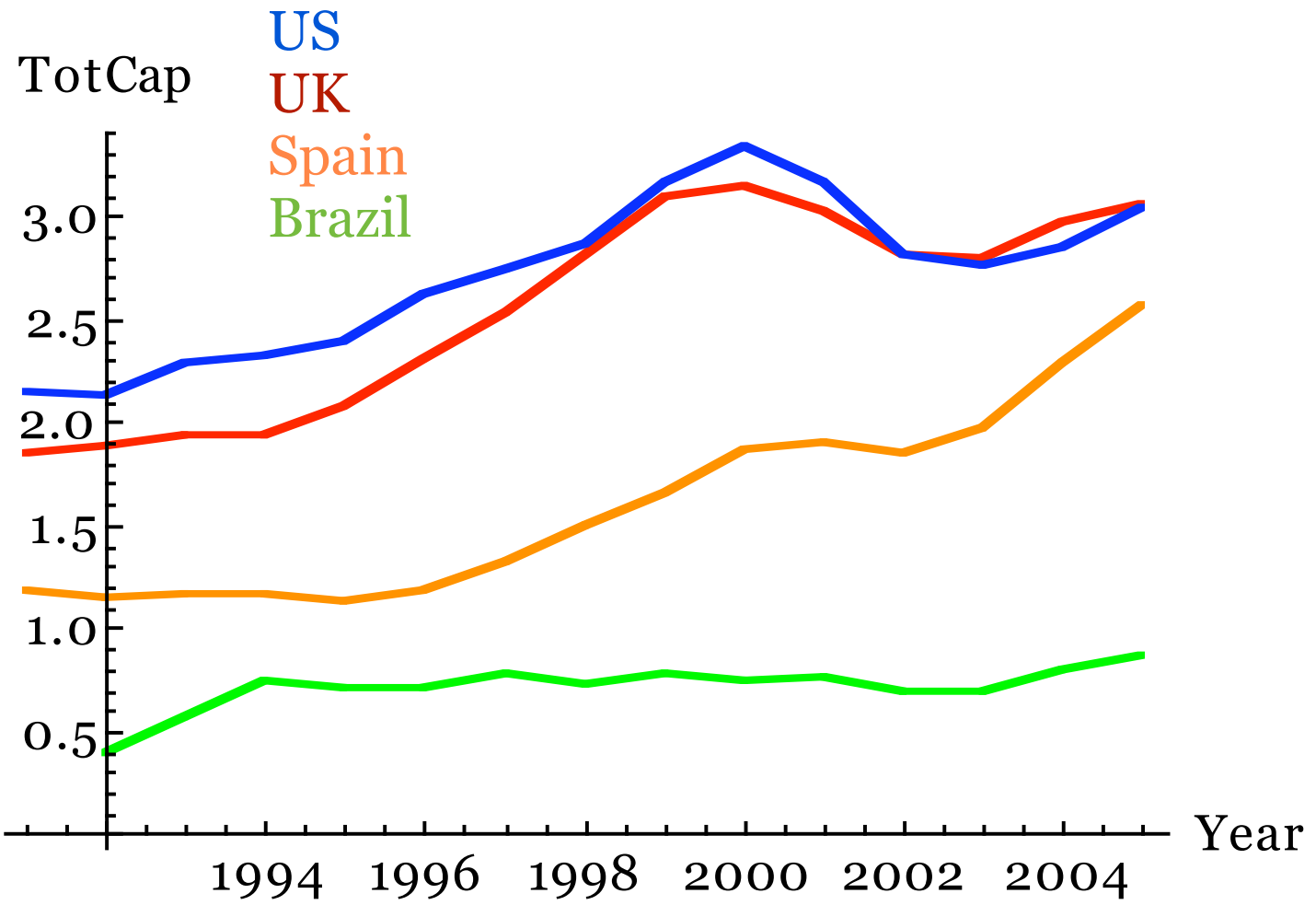
Financial Market "Efficiency": Level



Data: World Bank

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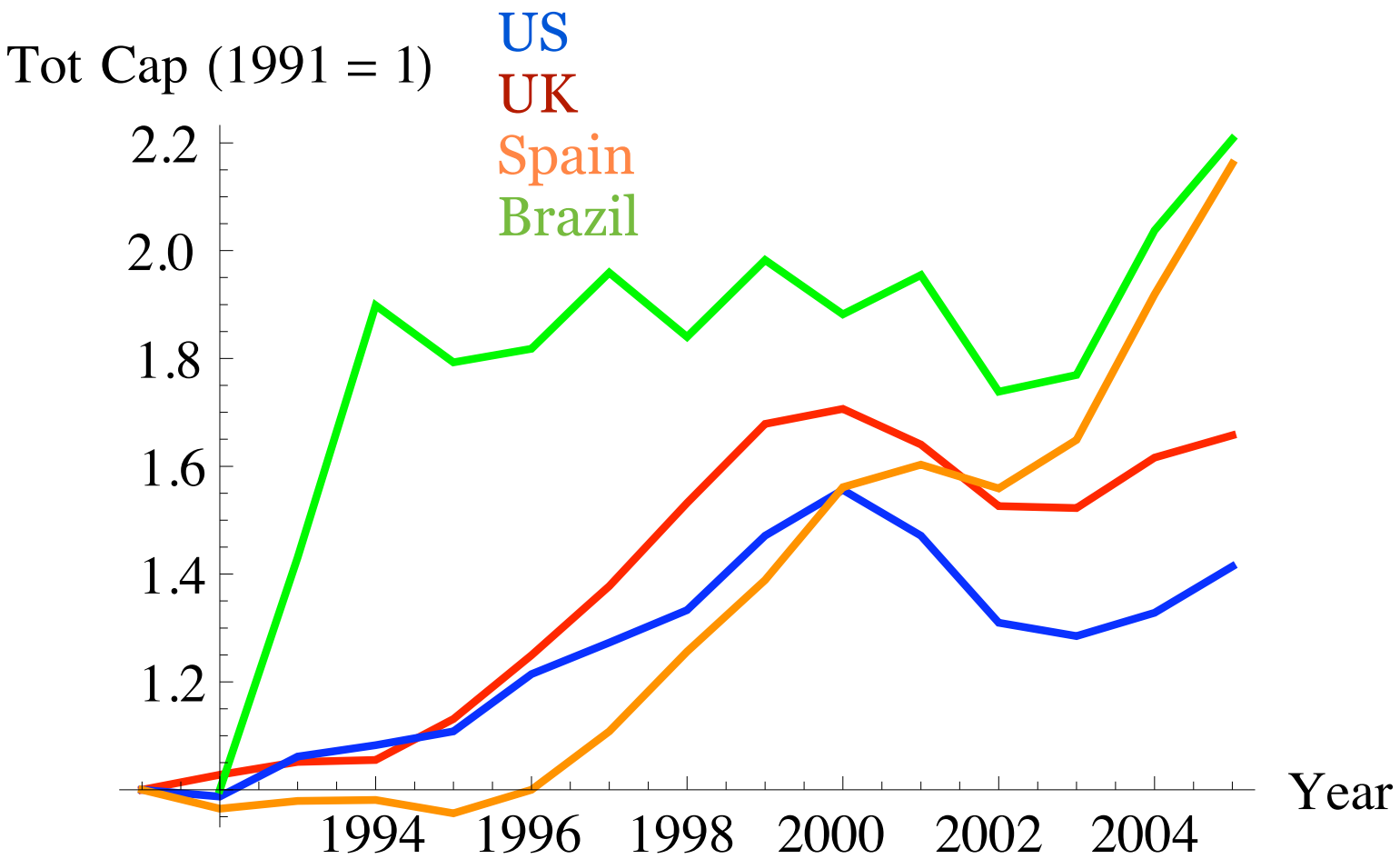
“Financial Efficiency”: Growth



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kevin.james@bankofengland.co.uk

Total Capitalization: The Big Picture

- Financial efficiency is increasing rapidly
- Financial efficiency is increasing more or less everywhere…
- …Suggesting that maybe **policy** does not matter that much outside so long as it is not actively destructive (e.g., North Korea, Zimbabwe)

kevin.james@bankofengland.co.uk

It only comes up to here on my ducks

- The key advantage of the TotCap measure of financial efficiency is that it does not require any understanding of how financial markets actually work
  - Hence, it is very easy to calculate
  - Because it is easy to calculate, it opens up many possibilities for running regressions

- But, in a way, judging financial market efficiency with TotCap is kind of like judging a meal by the cost of its ingredients

- One can see how such measures could lead one seriously astray

kevin.james@bankofengland.co.uk

An Alternative: Eat the Pudding!

- The financial system provides the real economy with the financial services it requires to function effectively
- One can therefore measure the efficiency (and stability) of a financial system by measuring the price of those services *from the perspective of users in the real economy*
  - So, the cost of portfolio management rather than the cost of trading a share
- If it turns out that this bottom-up approach provides the same answers as the TotCap approach, then we can be happy using TotCap in the future

kevin.james@bankofengland.co.uk

Implementing This Approach

- Identify key services that the financial system provides
- Develop theoretically sound measures of the price of that service
- Take the measures to the data
- Track the price of financial services over time within a regulatory regime and (ideally) across regimes so that one can get some insight into what works

kevin.james@bankofengland.co.uk

Our Menu for Today

- First Course: The cost of raising capital
- Second Course: The cost of portfolio management

kevin.james@bankofengland.co.uk

The Zagat Guide to the Results

- The cost of raising capital (through an IPO) in the US has been more or less constant over the 1985 to 2006 period

- The cost of portfolio management in the US (via a mutual fund) has been more or less constant over the 1991 to 2007 period

- So:
  - TotCap is not a very useful measure of financial market efficiency
  - Financial systems may not naturally evolve towards greater efficiency on their own
  - We should think rather more about how to get financial markets to work well

kevin.james@bankofengland.co.uk

Some Key TotCap Papers

Data

- World Bank Finance and Private Research Program

Papers

King and Levine (1993), "Finance and Growth: Schumpeter Might Be Right", QJE 108(3)

Rajan and Zingales (1998), "Financial Dependence and Growth", AER 88(3)

Guiso, Sapienza, and Zingales (2004), "Does Local Financial Development Matter?", QJE 119(3)

Hartmann, Ferrando, Fritzer, Heider, Lauro, and Lo Duca (2006), "The Performance of the European Financial System", ECB Mimeo

Bena and Juranda (2008), "Which Firms Benefit More From Financial Development?", FMG Working Paper

kevin.james@bankofengland.co.uk

II. A First Course: The Cost of Raising Capital Via an IPO

kevin.james@bankofengland.co.uk

Initial Public Offerings

- When a company first raises capital by selling shares on the public market, it is called an *Initial Public Offering*

kevin.james@bankofengland.co.uk

The IPO Process

- A firm wishing to go public chooses a bank to underwrite the deal

- That bank will become the deal's Book Manager (or Book)
  - The Book may also organize a syndicate to help allocate shares

- The Book must: 1) set an offer price for the shares (the initial price); and 2) allocate the shares to investors it selects at that offer price

kevin.james@bankofengland.co.uk

- If the investors decline the shares, the offering fails (a big disaster for both the bank and the firm)

- If the investors accept, the offering succeeds
  - The investors get the shares at the offer price;
  - The shares are listed on an Exchange;
  - Secondary trading begins on the Exchange;
  - The Book may act to facilitate secondary market trading

- The book's key task: set an **offer price** such that investors do accept the shares

kevin.james@bankofengland.co.uk

Who gets what (per share)

- The firm
  - The firm gets the offer price minus total fees (in the US, fees almost always equal 7% of the offering)
    - IPO Net Proceeds for the firm = P – (F * P)

- The Book (and syndicate members)
  - The Book, syndicate members, lawyers, etc. split the gross fees
    - Total fees = P * F

kevin.james@bankofengland.co.uk

- Investors: The investors get shares worth V for a price of P
  - Investor profit = V – P

kevin.james@bankofengland.co.uk

The cost of raising capital

- Total cost of the offering:
  - Total Cost = Investor profit + Fees = $(V - P) + (F * P)$
- Total cash raised for the firm
  - Net Proceeds = $P - (F * P)$
- Cost Per $ raised = Total Cost/Net Proceeds

$$C_{Raise} = ((V - P) + (F * P))/((P - (F * P))$$

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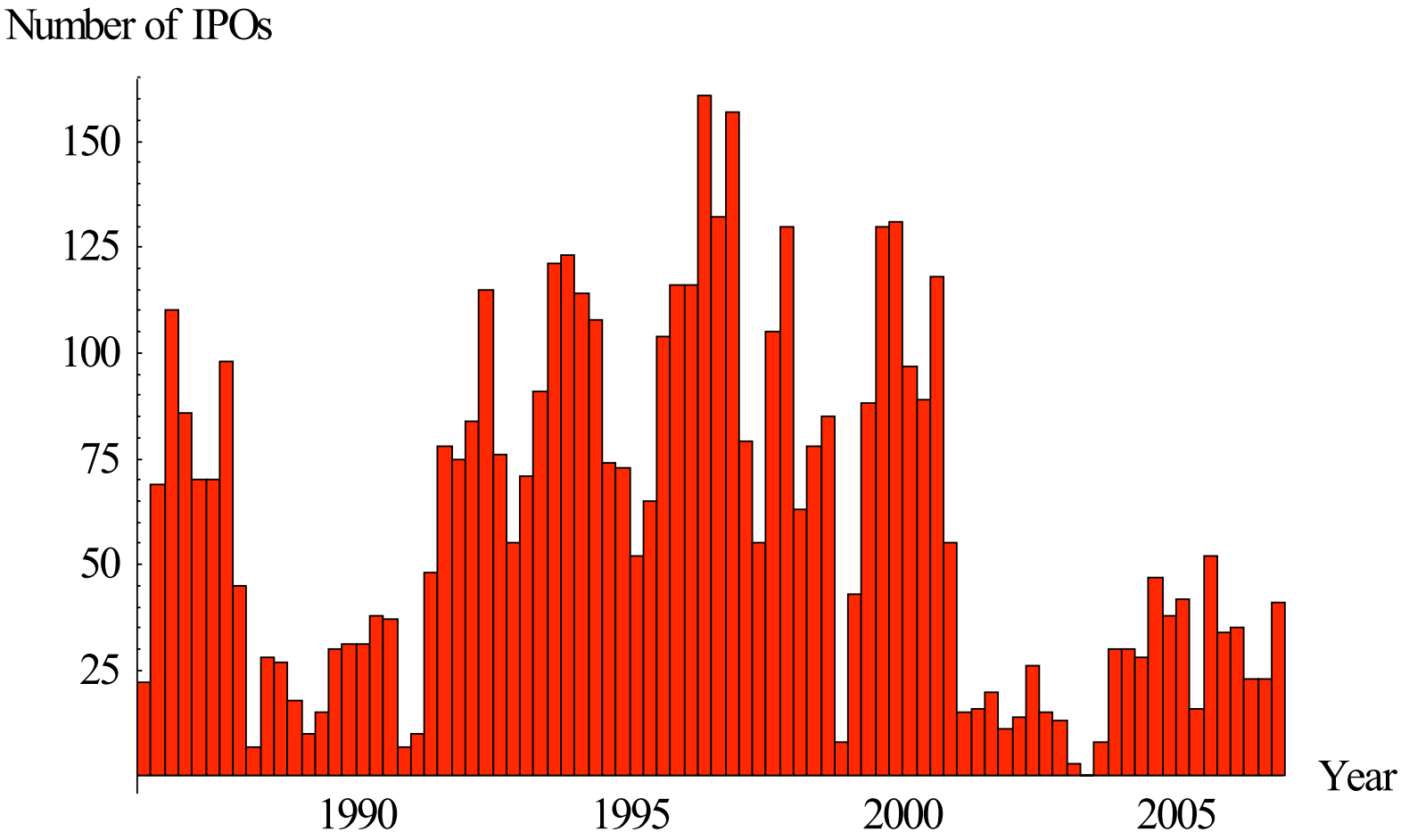
Cost of raising capital: An Illustration

- Suppose that:
  - P = \$10, V = \$18, F = 10%
  - Net Proceeds = (P – (F * P)) = \$10 – (10% * \$10) = \$9
  - Fees = F * P = \$10 * 10% = \$1
  - Investor Profit = V – P = \$18 – \$10 = \$8
  - C_{Raise} = (Investor Profit + Fees)/Net Proceeds

    = (\$8 + \$1)/\$9 = \$1

kevin.james@bankofengland.co.uk

The Number of IPOs per Month



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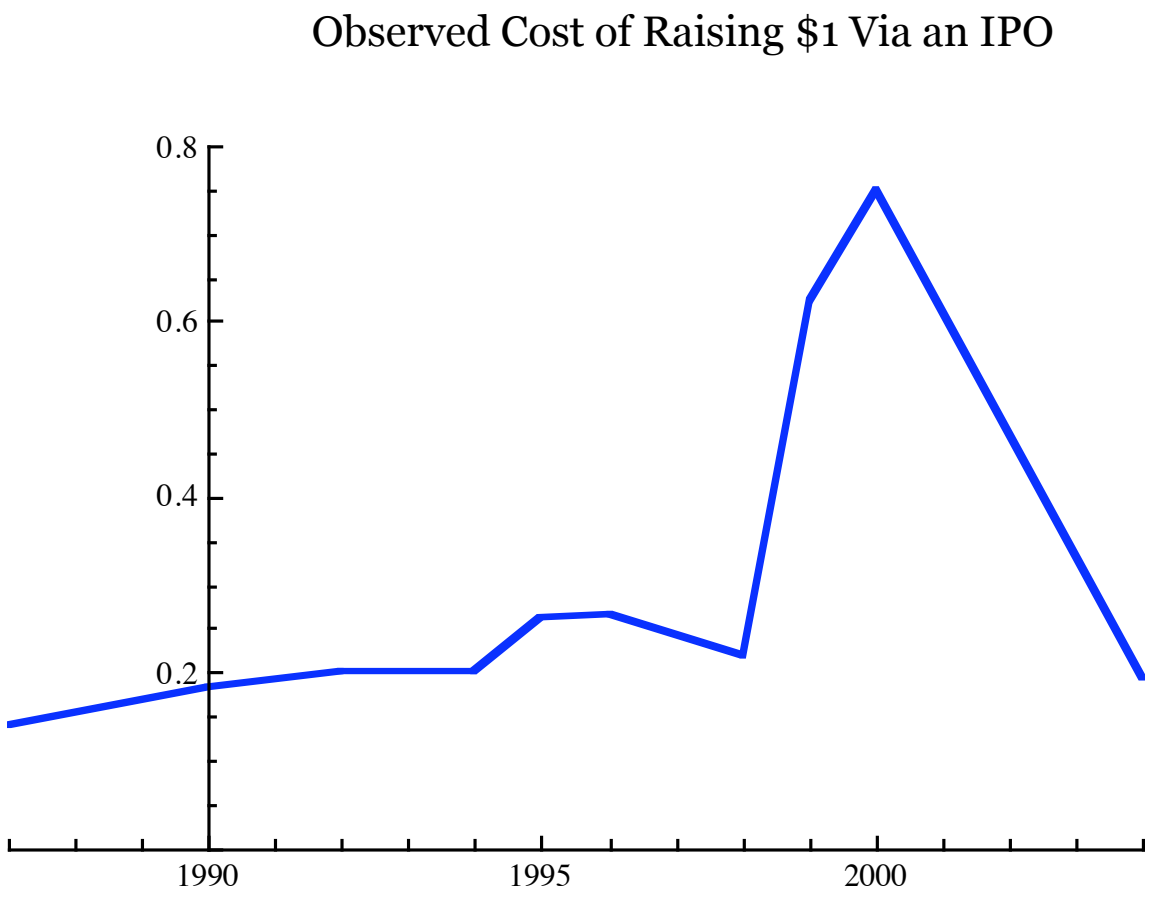
The Observed Cost of Raising $1 of Capital Via an IPO



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The IPO Market: First Impressions

- The IPO market in the US looks highly unstable
  - Volume and cost of raising capital numbers bounce around enormously;

- The market looks highly inefficient (at least for tech firms)
  - The cost to raise $1 in the early 90's was about $0.20
  - The cost rose by about 400% at the height of the tech boom of the late 90's!!!

<u>The market looks both unstable and inefficient</u>

kevin.james@bankofengland.co.uk

Step 1: How do banks set offer prices?

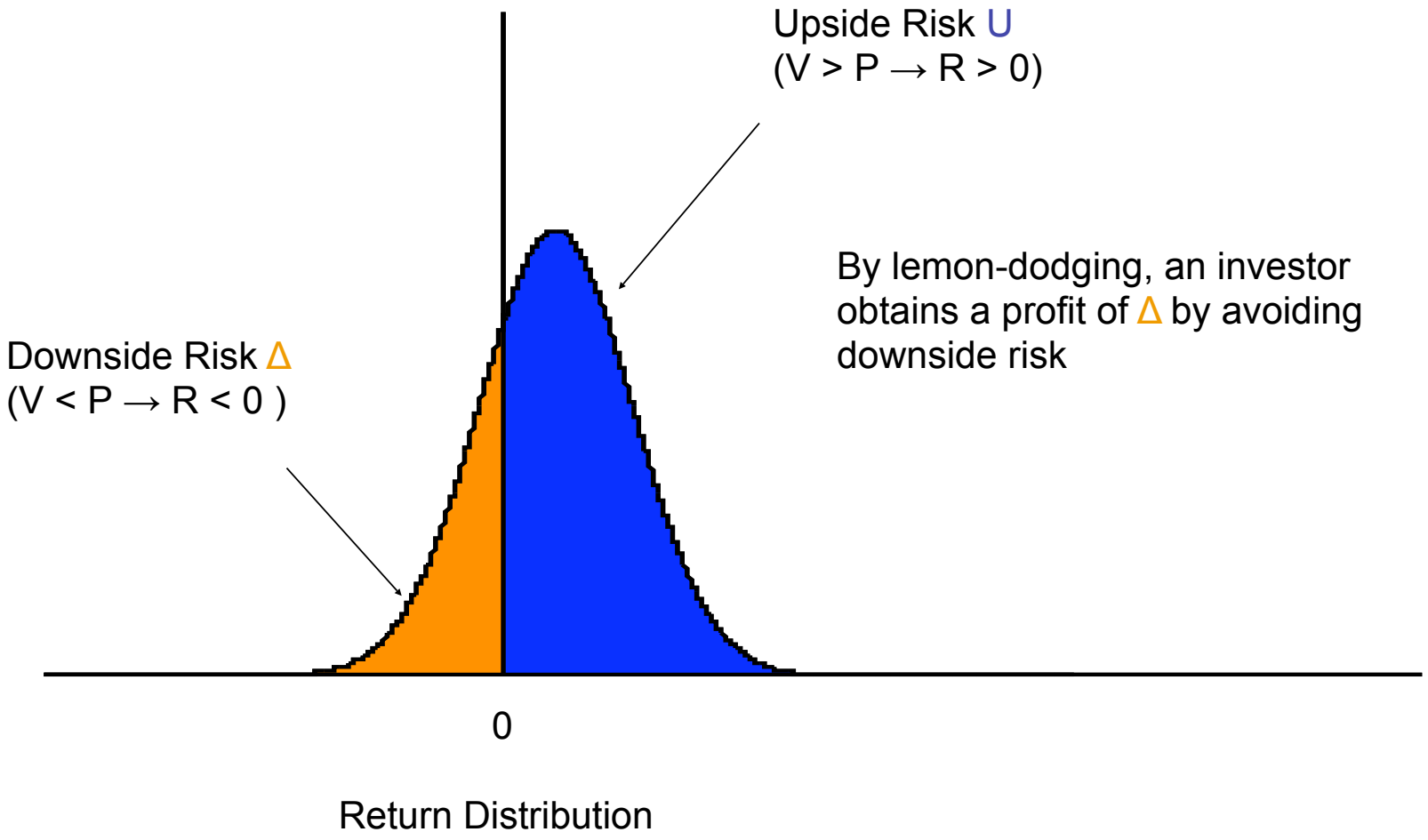
kevin.james@bankofengland.co.uk

The Bank's Problem

- The bank must set an offer price P without knowing the firm's market value V
- Given a concrete offer to buy at P, an investor can tell (at some cost and with some probability) if P > V
  - Investors who behave in this way are "lemon-dodging"
- The bank must set P such that investors **always** choose to purchase
  - The cost of a failed offering is very high

kevin.james@bankofengland.co.uk

An IPO's Return Distribution for P > 0



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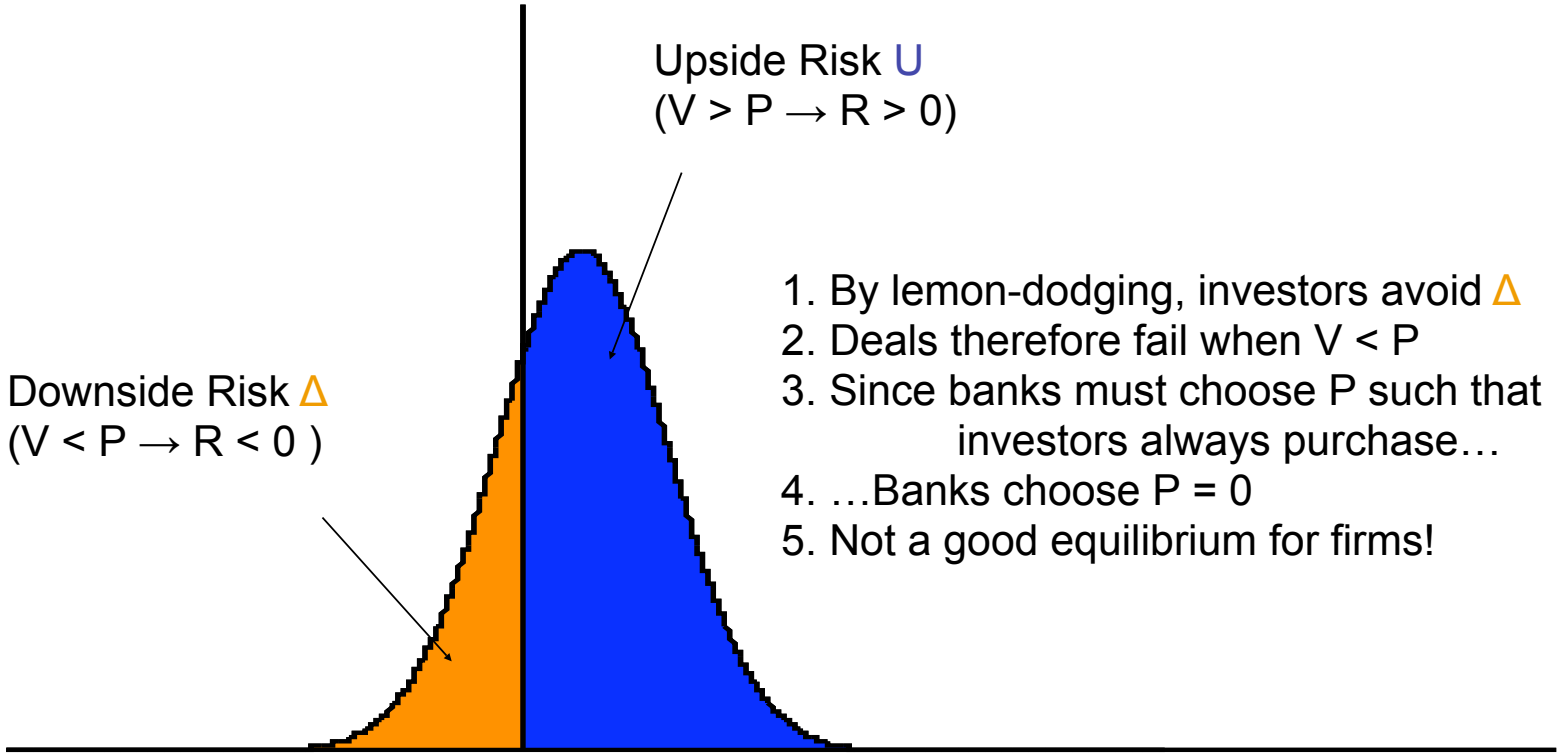
A One Time Game: Investors Always Lemon-Dodge



1. By lemon-dodging, investors avoid Δ
2. Deals therefore fail when V < P
3. Since banks must choose P such that investors always purchase…
4. …Banks choose P = 0
5. Not a good equilibrium for firms!

kevin.james@bankofengland.co.uk

The Bank's Solution to Lemon-Dodging

- To get investors to buy the block, the bank must devise some way of rewarding investors who make the (irrational in a one-time game) choice to not lemon-dodge

kevin.james@bankofengland.co.uk

- To do this, the bank enters into a repeat game with a coalition of investors
  - The bank offers its investors **on-average** underpriced IPO shares ($P < E[V]$)
  - Investors expect to obtain benefits of χ by participating in on-average underpriced IPOs in the future

- Call this strategy "Block-Booking"

kevin.james@bankofengland.co.uk

The Pricing Implications of Block-Booking

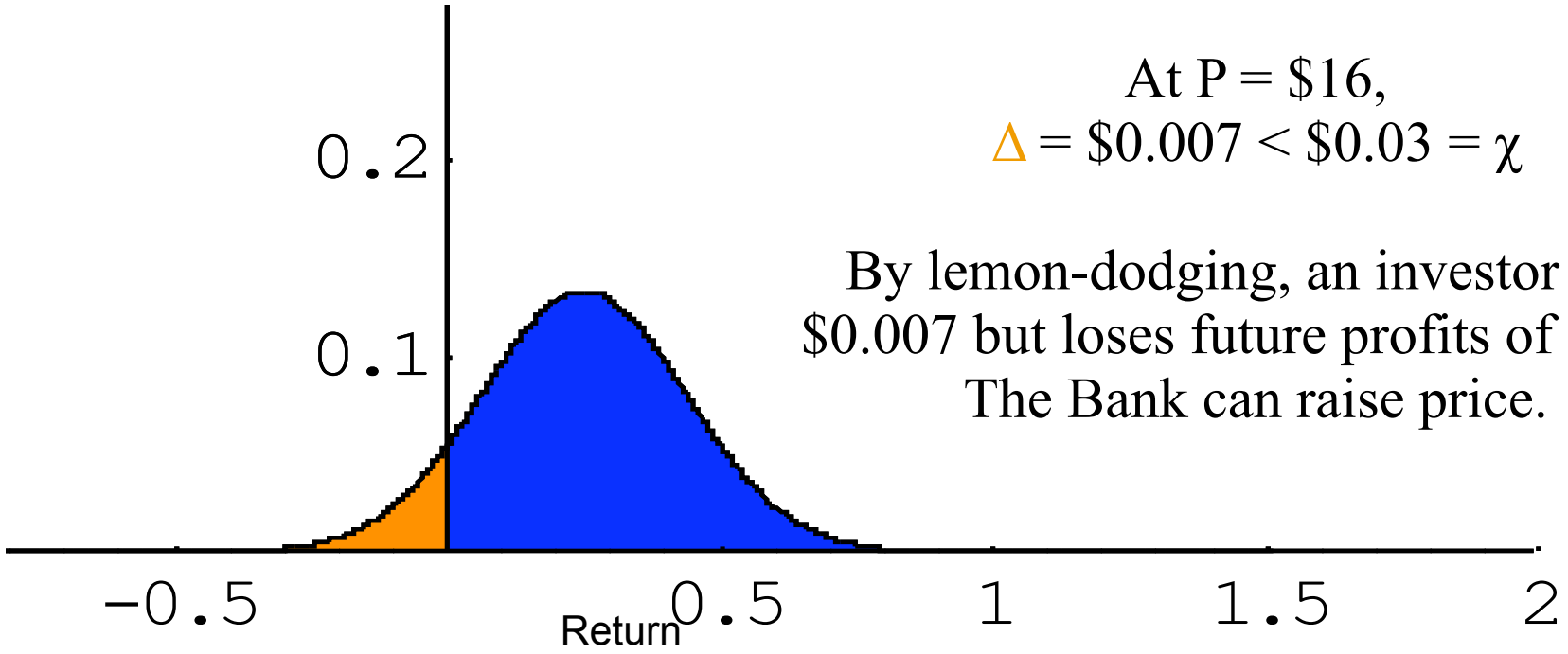
- Suppose that χ = \$0.03 (investors invest \$1 per IPO)

- Consider two Firm types:
  - Low Risk: V ~ Normal [20, 3]
  - High Risk: V ~ Normal [20, 5]

- Consider the equilibrium offer price P

kevin.james@bankofengland.co.uk

Low Risk Firm, P = $16

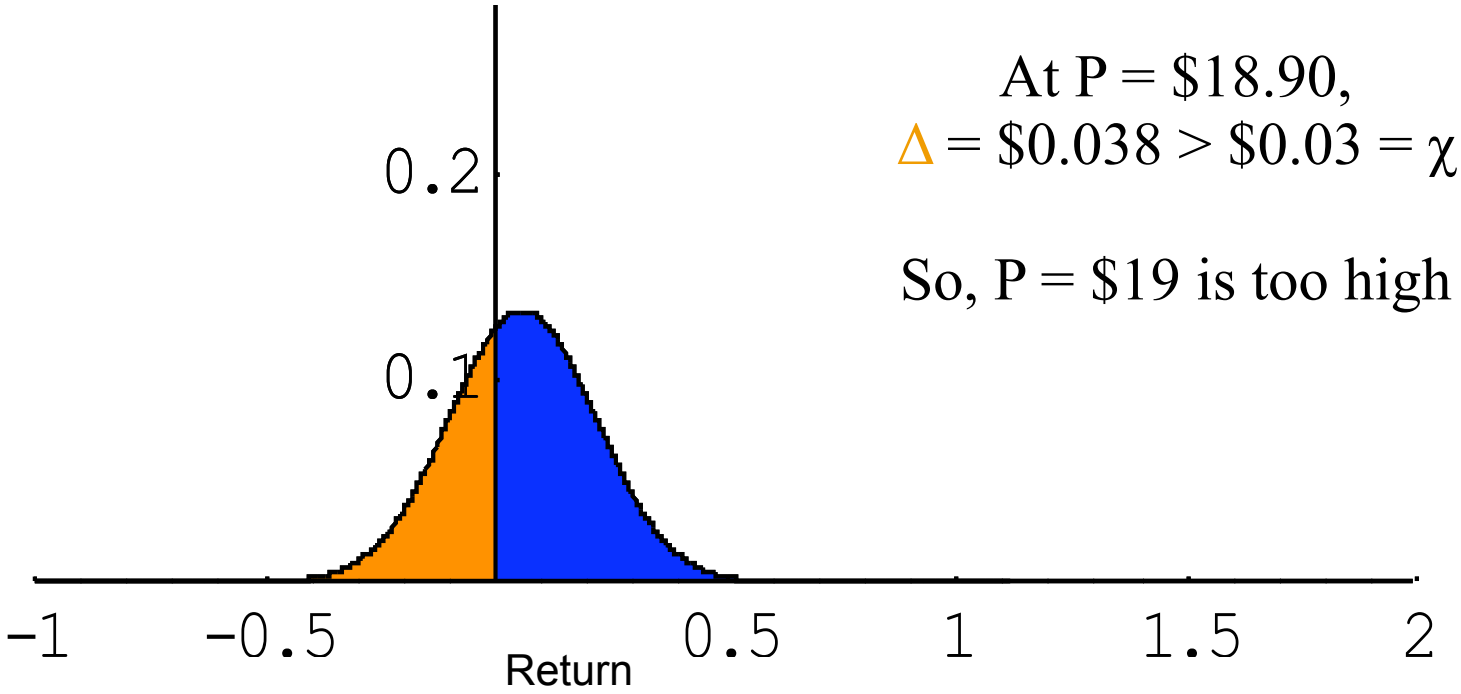


At P = $16,
Δ = $0.007 < $0.03 = χ

By lemon-dodging, an investor gets $0.007 but loses future profits of $0.03. The Bank can raise price.

kevin.james@bankofengland.co.uk

Low Risk Firm, P = $19

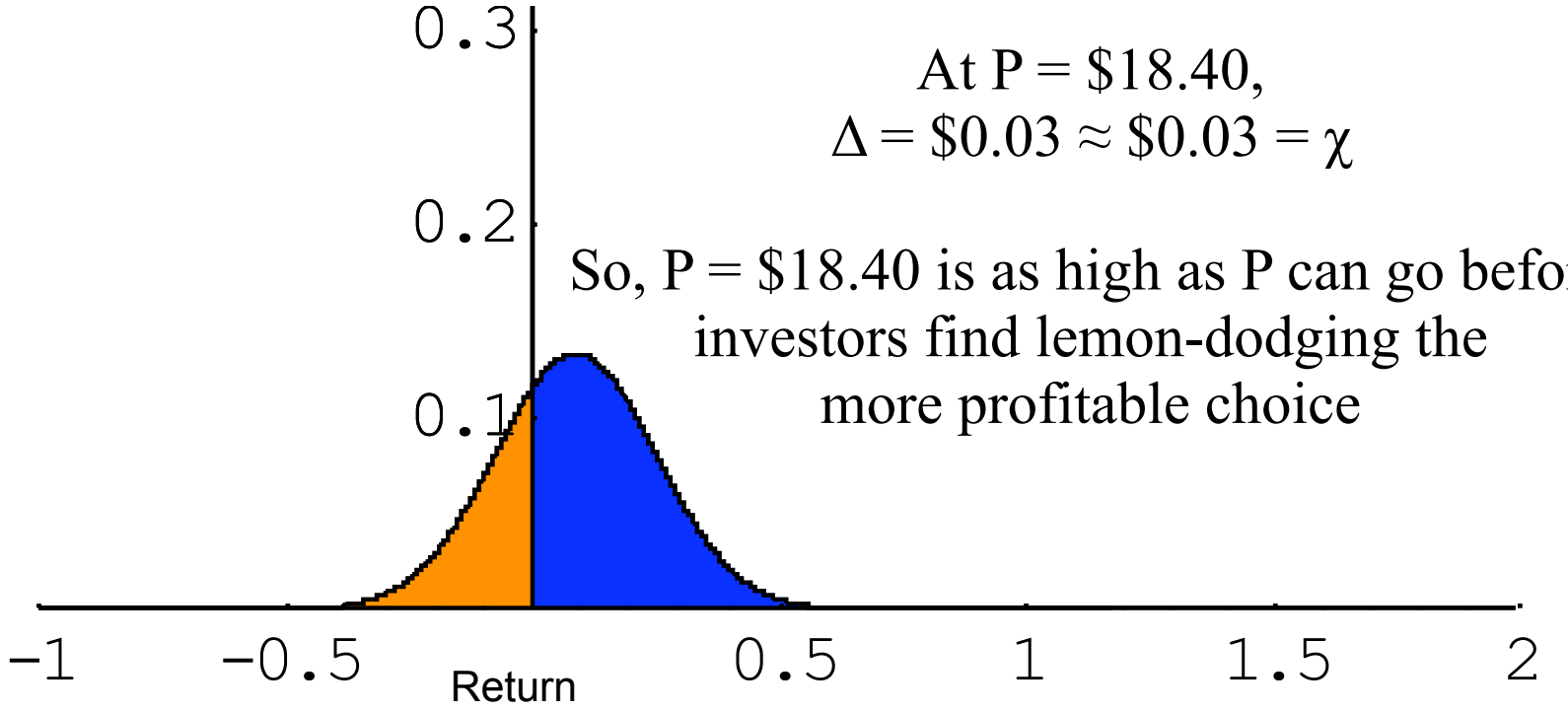


At P = $18.90,
Δ = $0.038 > $0.03 = χ

So, P = $19 is too high

kevin.james@bankofengland.co.uk

Low Risk Firm, P = $18.40



At P = $18.40,
Δ = $0.03 ≈ $0.03 = χ

So, P = $18.40 is as high as P can go before investors find lemon-dodging the more profitable choice

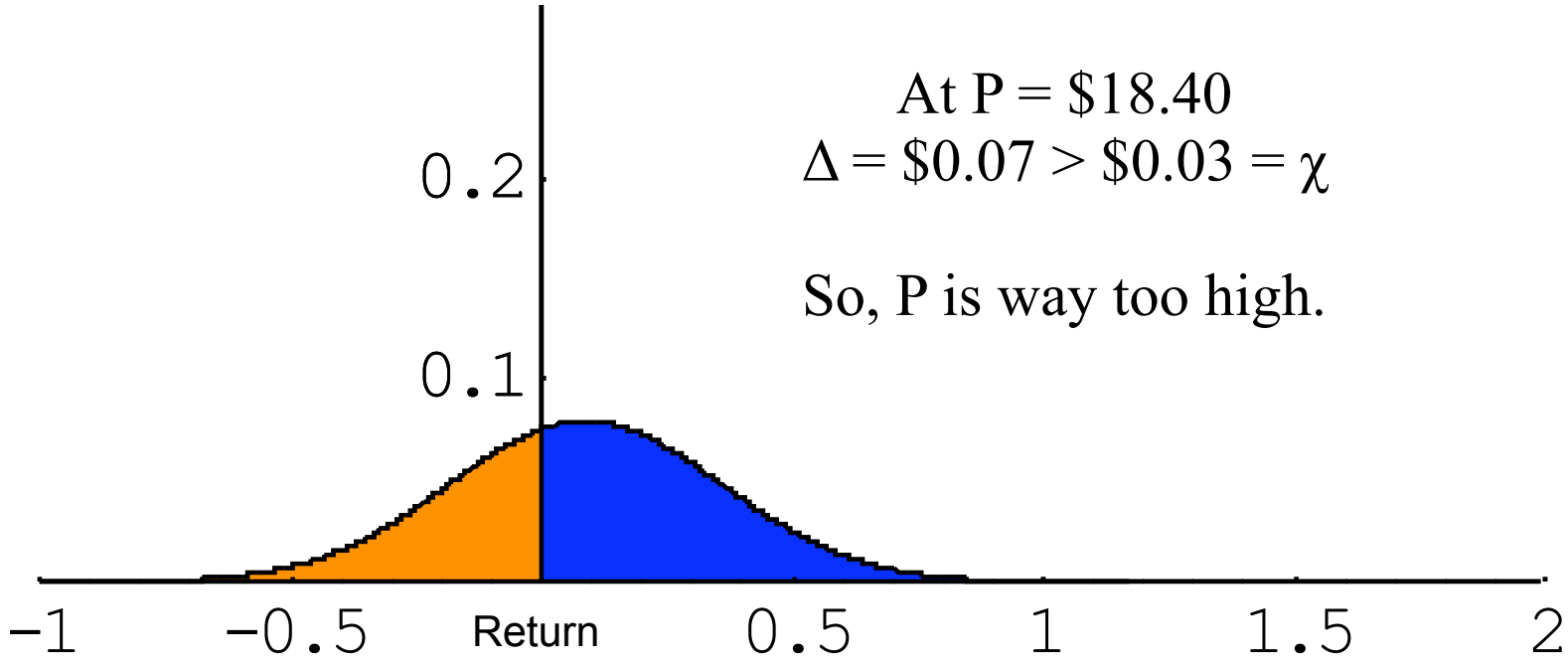
kevin.james@bankofengland.co.uk

Low Risk Firm Equilibrium

- Offer Price: $18.40
- Expected Return: 8.6%
- Cost of Raising $1: $0.17

kevin.james@bankofengland.co.uk

High Risk Firm, P = $18.40



At P = $18.40

Δ = $0.07 > $0.03 = χ

So, P is way too high.

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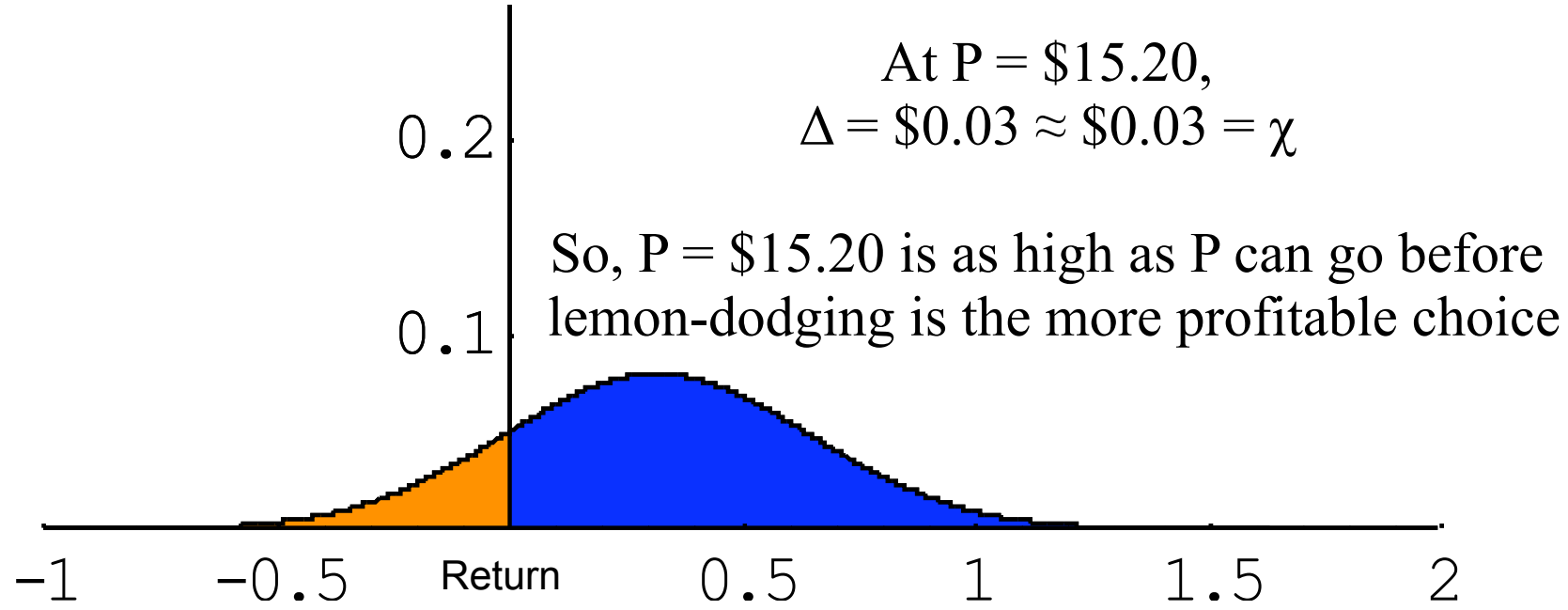
High Risk Firm, P = $15.20



At P = $15.20,
Δ = $0.03 ≈ $0.03 = χ

So, P = $15.20 is as high as P can go before lemon-dodging is the more profitable choice

kevin.james@bankofengland.co.uk

High Risk Firm Equilibrium

- Offer Price: $15.20
- Expected Return: 31.6%
- Cost of Raising $1: $0.415

kevin.james@bankofengland.co.uk

What's Going On?

- Since the punishment the bank can impose for lemon-dodging is the same for all IPOs, the bank acts to

Equalize Downside Risk Across Its Offerings

- Downside risk increases faster for high risk firms

kevin.james@bankofengland.co.uk

A Measure of the Cost of Raising Capital

- Consider two IPOs, A and B
  - A: Offer Price P_A, share value distribution Φ_A, downside risk Δ_A
  - B: Offer Price P_B, share value distribution Φ_B, downside risk Δ_B
- Take IPO_A as our base case
- There exits an α such that $\Delta_B[P_B * \alpha] = \Delta_A$
  - If $\alpha = 1$, then A and B are priced using the same rule
  - If $\alpha > 1$, then P_B is **lower** than it would be if it were priced using the same rule as A
  - If $\alpha < 1$, the P_B is **higher** than it would be if it were priced using the same rule as A

kevin.james@bankofengland.co.uk

The Cost of Raising Capital Over Time

- Divide IPOs into groups by time
- Take the first group as the base case
- Estimate α for each subsequent group
- The level of α will reveal whether and how the economy's IPO pricing rule is changing over time

kevin.james@bankofengland.co.uk

2. Go to the data

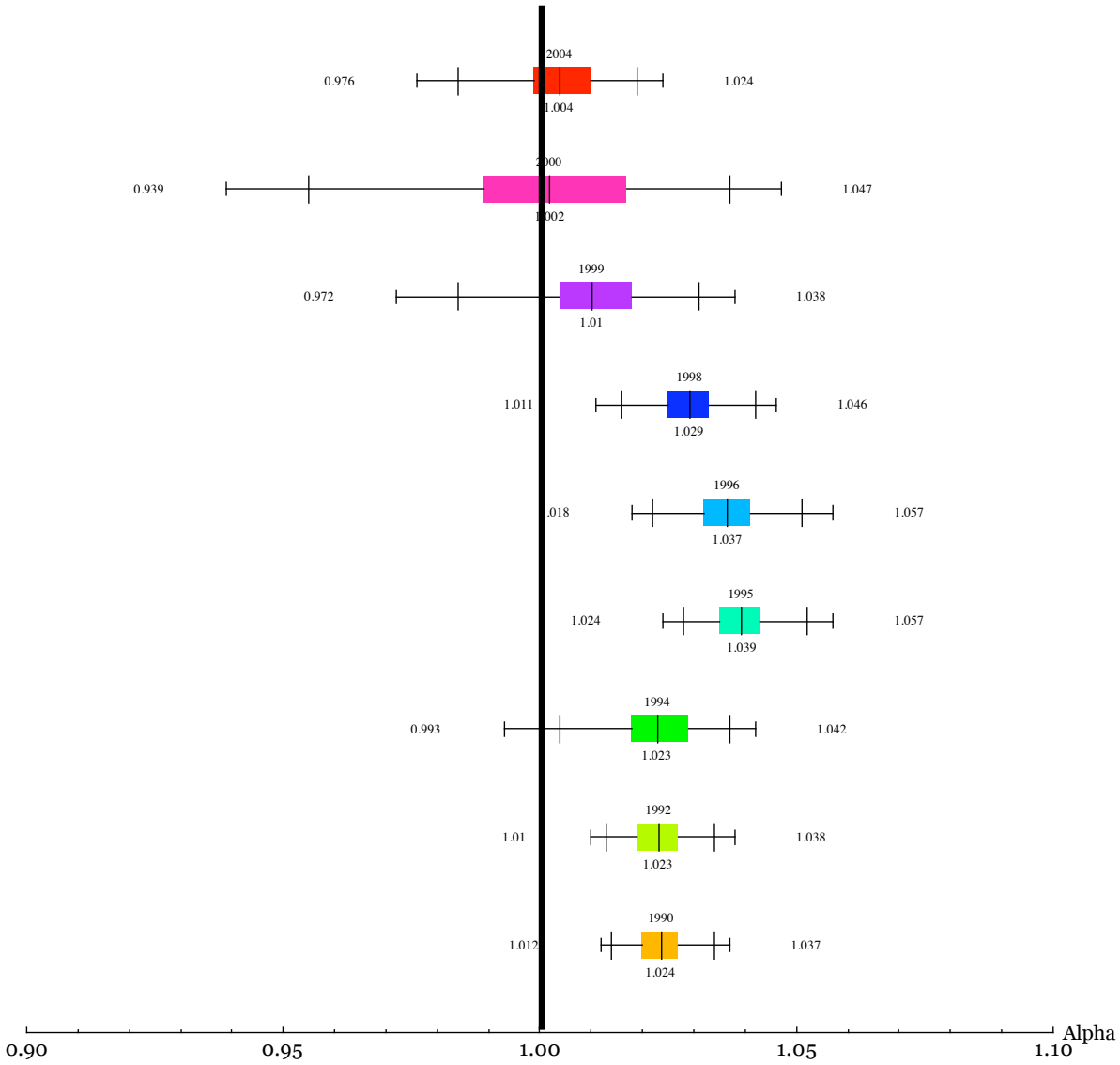
kevin.james@bankofengland.co.uk

IPO Groups

- Sample Period: 1985 to 2006
- Sample size: 5002 IPOs
- Groups: Divide IPOs into 10 groups of 500
- Estimate α (with confidence interval) using the method of Gondat-Larralde and James (2008)

kevin.james@bankofengland.co.uk

Results



kevin.james@bankofengland.co.uk

Results

- The cost of raising capital via an IPO in the US has been more or less constant over the 1985 to 2006 period
  - That is, IPOs are priced using the same pricing rule
  - The cost of raising capital will still vary from IPO to IPO due to risk

kevin.james@bankofengland.co.uk

IPO Papers

- Gondat-Larralde and James (2008), "IPO Pricing and Share Allocation: The Importance of Being Ignorant", *J. of Finance* (February)

kevin.james@bankofengland.co.uk

III. A Second Course: The Cost of Portfolio Management

kevin.james@bankofengland.co.uk

A Measure

- For equity funds, the obvious measure of cost is the gap between the fund's return and the market rate of return
  - Denote this gap as RGap

kevin.james@bankofengland.co.uk

Implementation Issues

- Is the market rate of return a good comparison?
  - Solution: limit sample to broad equity funds
- Small fund returns are highly volatile and biased
  - Fund management companies start and favor small funds, and then open them up to the public when after they achieve a run of good returns
  - Solution: Limit sample to reasonably large funds

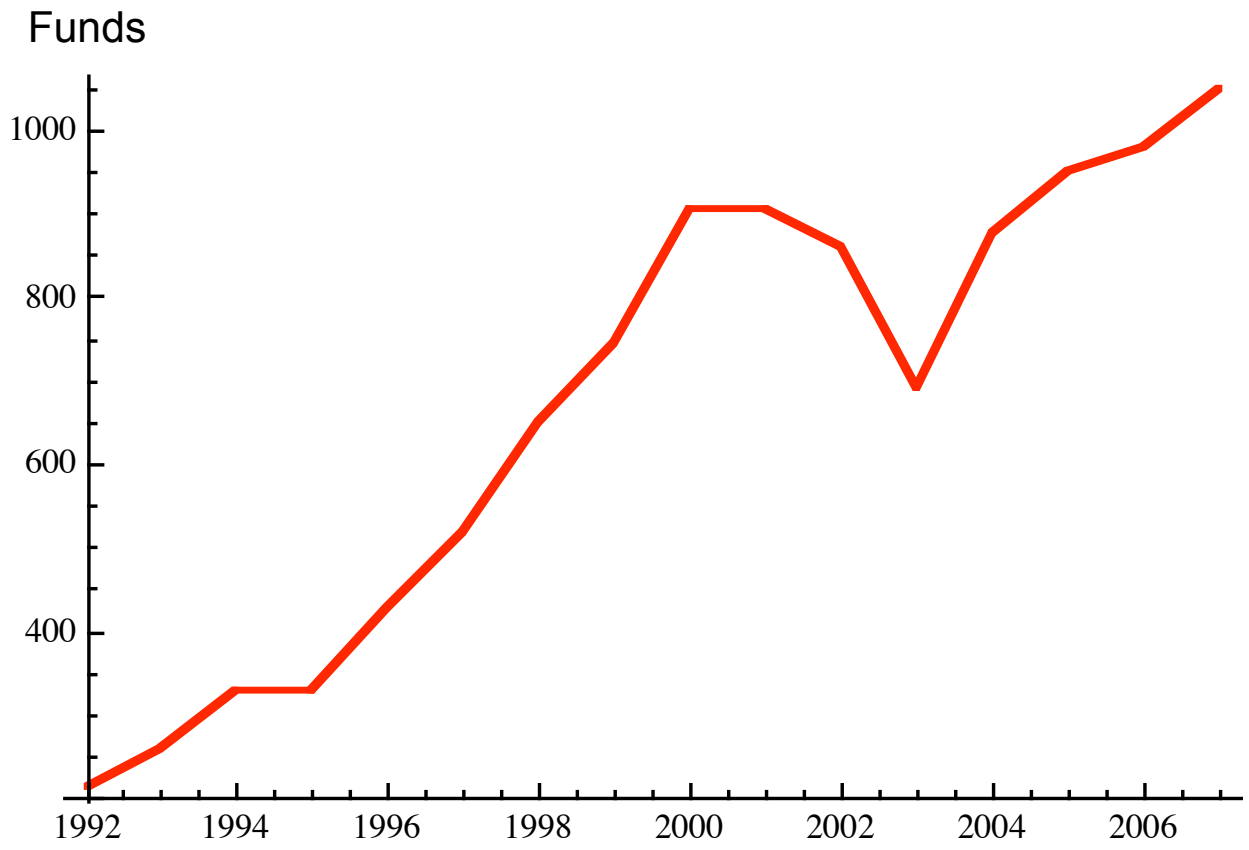
kevin.james@bankofengland.co.uk

Sample

- Type: US Broad Equity Funds
  - Assets under management at start of year > $500 Million ($Y2000)
  - Include fund in sample if it has 12 months of return data for year
- Period: 1992 to 2007

kevin.james@bankofengland.co.uk

Sample Size By Year



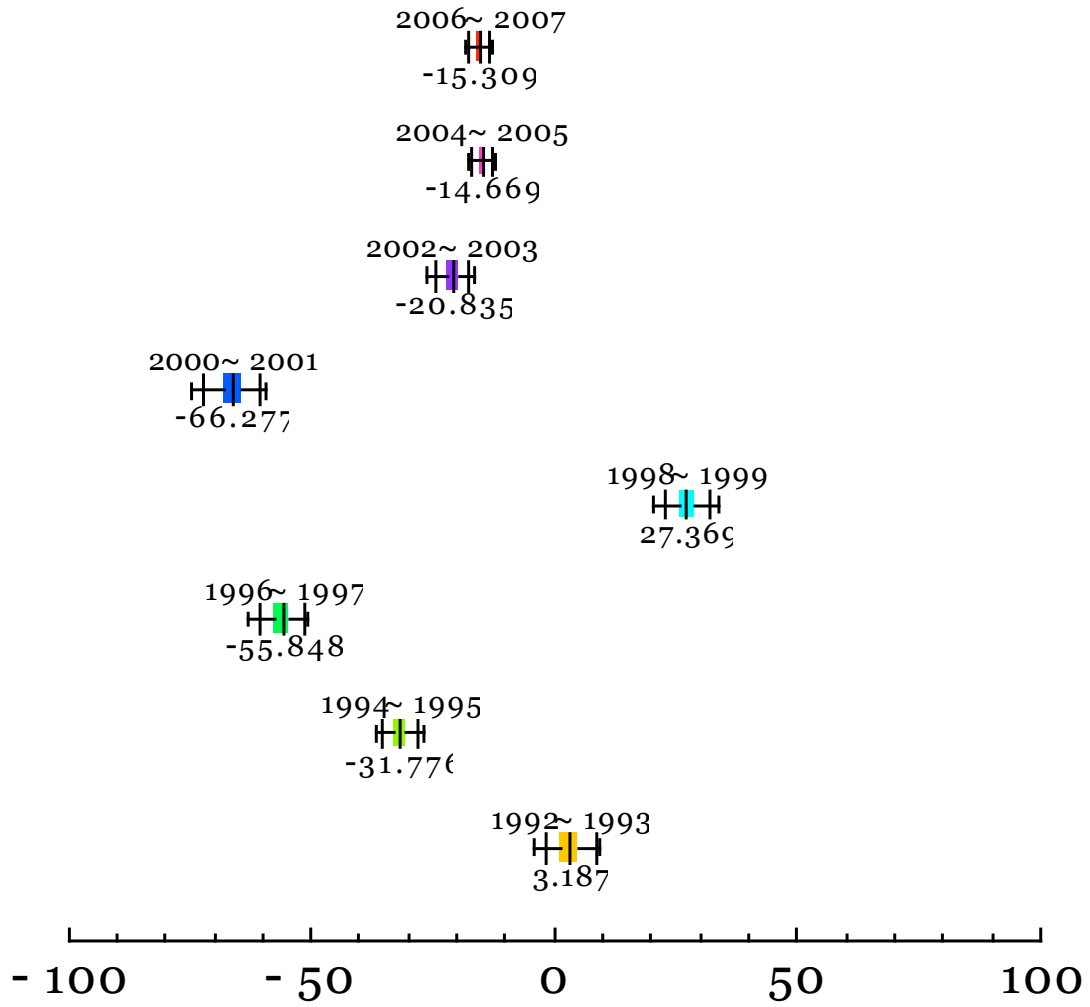
kevin.james@bankofengland.co.uk

Method

- Estimate the Mean Monthly Fund RGap over Time
- To get a good sample size, pool together adjacent years
- For each month in each 2 year group:
  - draw a bootstrap sample of fund RGaps;
  - calculate the Mean RGap for each month;
  - Take the Mean of these 24 Monthly Mean RGaps;
  - Repeat 10,000 times;
  - Sort these 10,000 Mean Monthly Returns by size;
  - Use this list to construct a confidence interval for the Mean fund RGap for that year group

kevin.james@bankofengland.co.uk

Mean Monthly RGaps (Basis Points)



kevin.james@bankofengland.co.uk

Results

- The mean monthly RGap has bounced around
- But, there is no trend towards 0
- Indeed, the average for the years 1992 to 1999 is more or less the same as that from 2002 to 2007
  - The RGap estimates for the later period are less volatile due to larger sample sizes
- The price of investing through mutual funds has not fallen over the 1992 to 2007 period
  - Of course, the cost of share trading (etc.) has fallen;
  - Focus on the cost of the service, not the inputs

kevin.james@bankofengland.co.uk

Conclusion

kevin.james@bankofengland.co.uk

Measuring Financial Sector Efficiency

- The size (and activity) of the financial sector has expanded rapidly almost everywhere over the last 20 years…
- …but size isn't everything
- In particular, while size and or/activity may be a good indicator of financial sector wages, size/activity is a poor measure of efficiency from the perspective of the real economy
- To get a good measure, one must look at the cost of the services the financial sector provides to the real economy

kevin.james@bankofengland.co.uk

Eat the Pudding

- In order to measure financial sector efficiency accurately, one must:
  - develop theoretically sound measures of the cost of financial services from the perspective of the real economy; and
  - take these measures to the data
- After doing this, one will be in a position to think about what determines financial sector efficiency…
- And this matters because financial systems don't necessarily evolve towards greater efficiency all by themselves

kevin.james@bankofengland.co.uk