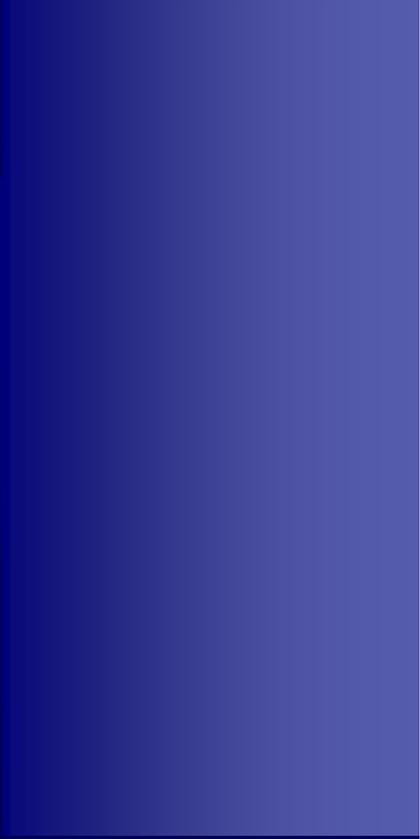


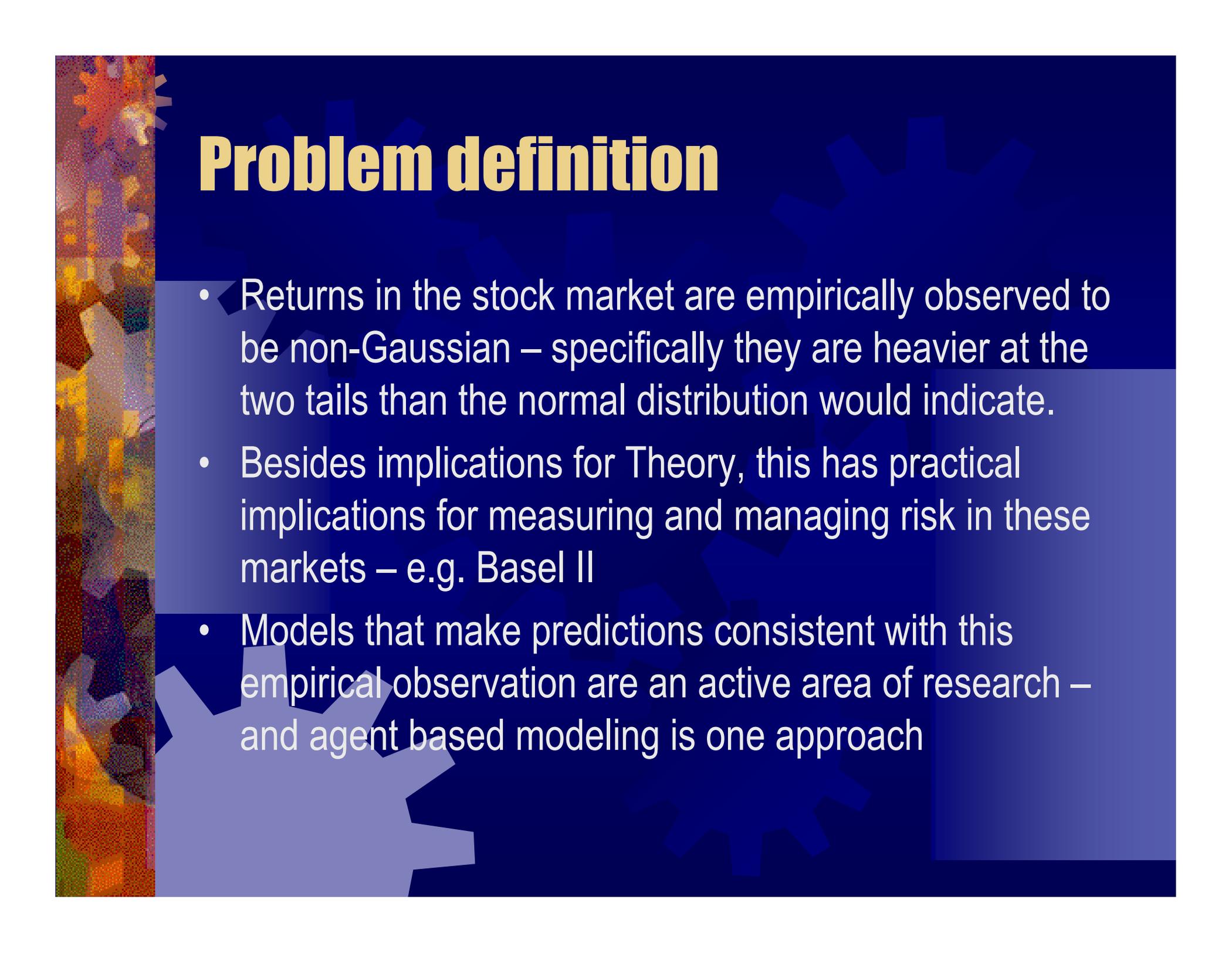
The background features a dark blue field with several large, semi-transparent gears of varying shades of blue. On the left side, there is a vertical strip with a colorful, pixelated cityscape or abstract pattern in shades of orange, yellow, and green. The title text is centered in a bold, yellow font.

# **Agent-based Simulation of Financial Markets**



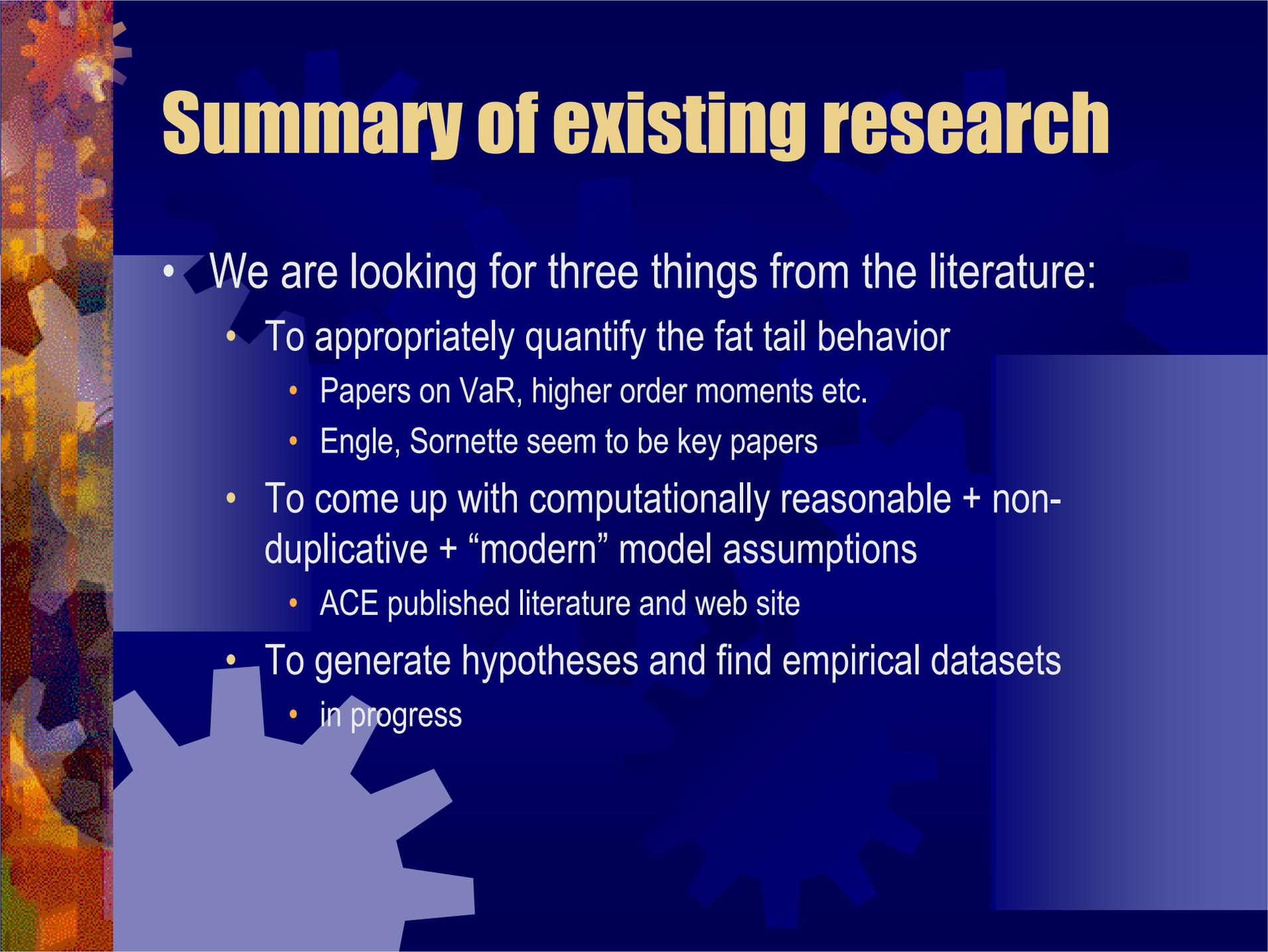
# Presentation Outline

- Problem definition
  - Summary of existing research
  - Work plan
  - Computational model
  - Questions I hope to address
  - Criticisms of my approach
- 



# Problem definition

- Returns in the stock market are empirically observed to be non-Gaussian – specifically they are heavier at the two tails than the normal distribution would indicate.
- Besides implications for Theory, this has practical implications for measuring and managing risk in these markets – e.g. Basel II
- Models that make predictions consistent with this empirical observation are an active area of research – and agent based modeling is one approach



# Summary of existing research

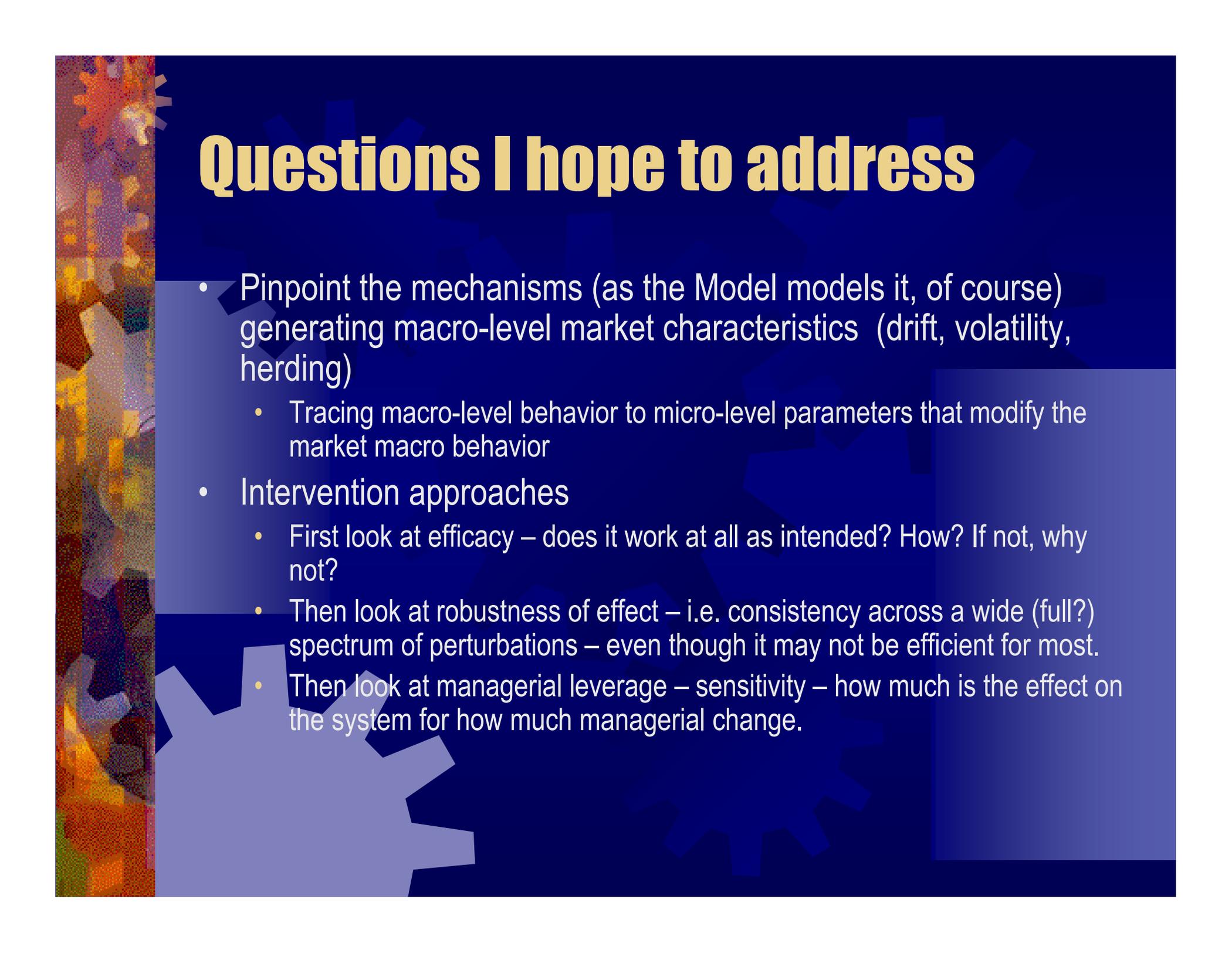
- We are looking for three things from the literature:
  - To appropriately quantify the fat tail behavior
    - Papers on VaR, higher order moments etc.
    - Engle, Sornette seem to be key papers
  - To come up with computationally reasonable + non-duplicative + “modern” model assumptions
    - ACE published literature and web site
  - To generate hypotheses and find empirical datasets
    - in progress

# Work plan

- Start with netlogo model of Gonçalves (2003)
- Adjust parameters, modify formulations
- Literature review to generate a partially addressed hypothesis, and/or identify a weak/incorrect model assumption that should be improved next
  - E.g. The Netlogo model we use as a starting point sets Price = market sentiment. This approach has several problems:
    - It ignores the fact that trades need to occur for price discovery and there are two sides to a trade, so some sellers as well as buyers need to exist
    - Also not all agents participate in determining price at any instant. Put another way, setting price based on AGGREGATE demand is a hidden way of setting price macroscopically and as if at local equilibrium, while at the same time pretending to be modeling its dynamics using agent-based modeling and in rich temporal detail – this appears to be a internal inconsistency in the model.
- Implement and test
- Write manuscript if results are worthy of publication

# Computational model

- Netlogo
- ACE toolkit at [iastate.edu](http://iastate.edu) if necessary



# Questions I hope to address

- Pinpoint the mechanisms (as the Model models it, of course) generating macro-level market characteristics (drift, volatility, herding)
  - Tracing macro-level behavior to micro-level parameters that modify the market macro behavior
- Intervention approaches
  - First look at efficacy – does it work at all as intended? How? If not, why not?
  - Then look at robustness of effect – i.e. consistency across a wide (full?) spectrum of perturbations – even though it may not be efficient for most.
  - Then look at managerial leverage – sensitivity – how much is the effect on the system for how much managerial change.



# Criticisms of the approach

- How do we know you are simulating a realistic market and not something that you kept on making up till you got an interesting publishable result?
- You seem conflicted - between focusing on getting market mechanisms right on one hand, and focused on the other hand on capturing a few of many possible empirical descriptors of past market behavior? Which one is important to you?
- You make unrealistic (or unjustified) assumptions in the agent behavior. This doesn't correspond, even as an idealization, to any market that I can think of.
- I don't understand your terminology. Give me not a vector of "agents", but a covariance matrix of returns. Can you translate what you have to statistical measures of risk? I know they are flawed, but I understand them and their flaws better than your stuff.
- Any other caveats to watch out for?