

# Discussion of: Chen, Dou, Kogan “Dark Matter in Asset Pricing”

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- ▶ Suppose the representative investor maximizes

$$E \left[ \frac{X(T)^{1-\gamma}}{1-\gamma} \right].$$

- ▶ Furthermore, the return of a stock between 0 and  $T$  is,
  - ▶ Normally distributed:
  - ▶ with expected return  $\mu$ ;
  - ▶ and standard deviation  $\sigma$ .
- ▶ Also the riskfree rate between 0 and  $T$  is  $r$ .
- ▶ In a *Rational Expectations* equilibrium, CAPM holds.
  - ▶ The representative agent knows  $\mu$  and  $\sigma$ .
- ▶ From security prices, we estimate market price of risk.
- ▶ **We don't know parameter values but assume agents do?**

# The Problem

- ▶ We (the economist/econometrician) try to estimate the parameters that drive the economy.
- ▶ We *know* the model that drives the economy.
- ▶ We have a lot of data, computer power and (hopefully) sophisticated methodologies.
- ▶ *Included* in the data is the resulting equilibrium prices.
- ▶ For this to work, economic agents *somehow* must know the parameter values.

# The Question in This Paper

- ▶ How important are the price equations in the final results?
  - ▶ Suppose agents don't have good estimates of parameter values.
  - ▶ Using equilibrium prices and their relation to underlying parameters is not realistic.
- ▶ Paper tries to measure the importance of the assumption that agents know parameter values precisely.

- ▶ Direct sensitivity analysis:
  - ▶ Assume some parameter values and change them.
  - ▶ If prices do not change much, the assumption is ok.
- ▶ Problem: In case of uncertainty, the whole distribution of priors is relevant.
  - ▶ For example, disaster events.
  - ▶ Another example, gambles.

- ▶ Introduces multidimensional measures:
  - ▶ Looking at the sensitivity of results with respect to the set of parameters.
- ▶ Their measures include also the probability distribution of priors.
  - ▶ This allows to consider the uncertainty of the economic agents.
- ▶ Overall, a sophisticated innovation in the measure of model robustness to rational expectations assumption.

# What Is Missing

- ▶ As stated by the authors, Bayesian learning.
  - ▶ Learning process affects equilibrium prices.
- ▶ Non-parametric distributions?
  - ▶ The measures requires some assumption about the type of the priors density (I think...).
  - ▶ How important is this assumption?

# Even More Fundamental Questions

- ▶ Assumption that the agent knows at least as much as the econometrician.
  - ▶ Doubtful.
  - ▶ Ambiguity aversion?
  - ▶ At least, Bayesian learning.
- ▶ Preferences.
  - ▶ CRRA is standard in finance and economics.
  - ▶ Probably not a good choice.
    - ▶ Is this assumption more heroic than rational expectations?



# About the *Rare Disasters* Example

- ▶ Fixed  $p$ ?
  - ▶ Another heroic assumption.
- ▶ Is it possible to estimate  $p$ ?
  - ▶ Maybe for Barro's disasters.
  - ▶ Are these the disasters we worry about in the US (where the economy is calibrated)?
- ▶ (Again...) Are CRRA preferences the right framework to consider *Black Swan* events?
  - ▶ CRRA preferences do not care about higher moments...