



# **Systemic Risk Analytics and Assessments**

Measuring Systemic Risk Conference  
Federal Reserve Banks of Chicago and New York and  
the Milton Friedman Institute for Research in Economics  
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# A quick market snapshot: conflicting themes in 2009-10

1. **Stress testing rather than correlation**
2. **Observable macro-economic factors rather than latent / implied factors**
3. **Micro (loan-level) rather than aggregate analysis**
4. **Some discussion of adapting credit and market portfolio analytics to systemic risk**
  - Acharaya, *et al.*
  - Adrian and Brunnermeier
  - etc.

# Some challenges in building measures of systemic risk

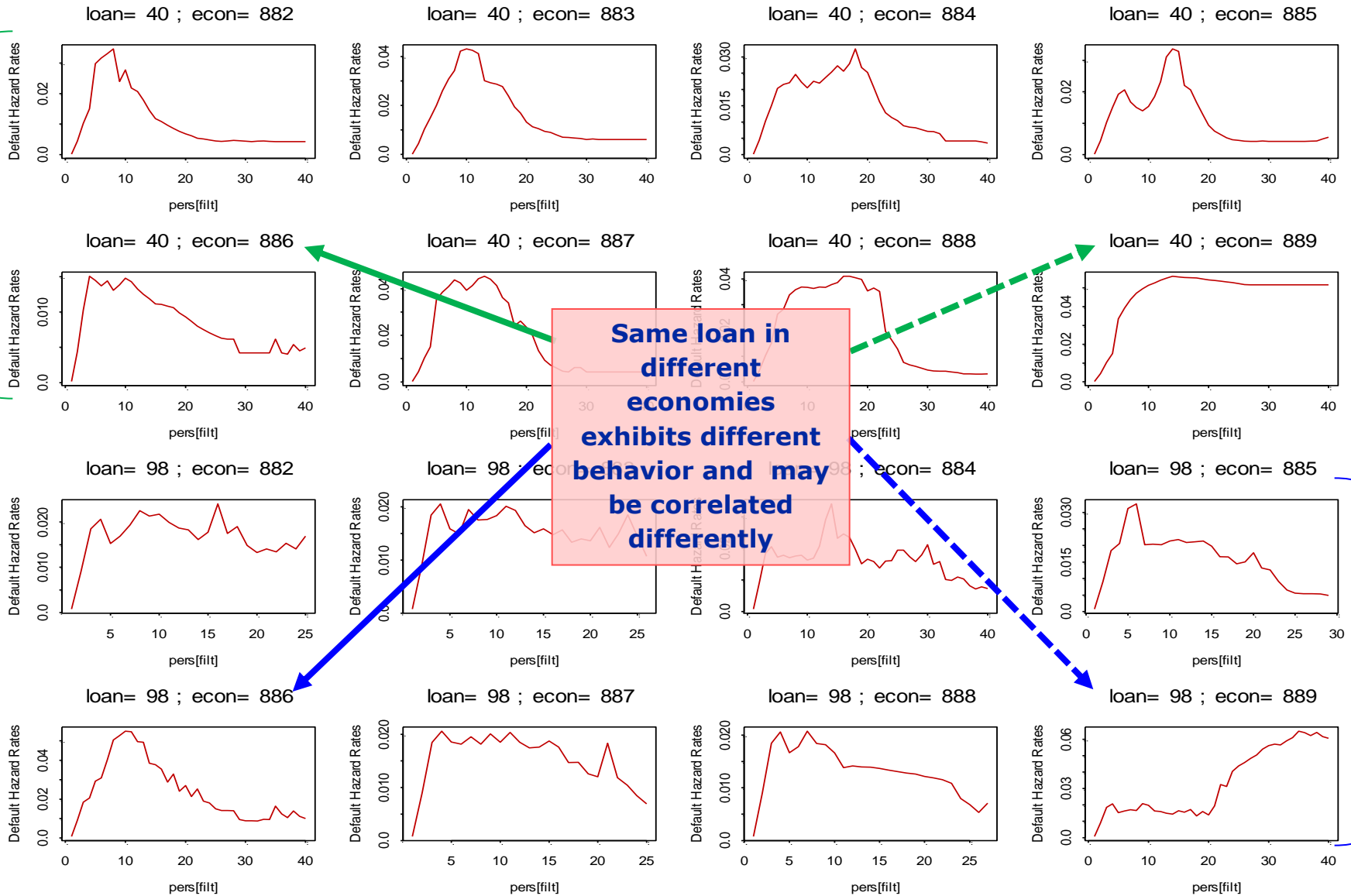
1. Determining the level of aggregation at which to model
2. Collecting/developing data in an analytically meaningful manner
3. Applying the measures in practical settings (risk attribution/allocation)

# Data granularity should align with analytic objective

	DATA DRIVEN	STRUCTURE DRIVEN
MICRO \ LINKED	<p>HHI measures, OLAP reporting, conditional heat maps, ...</p>	<p>Look through aggregation Agent-based simulation</p> <p>Counterparty networks, Interbank networks</p> <p>Family trees</p>
AGGREGATE	<p>Regime switching, PCA, spreads, heat maps, ...</p>	<p>CoVaR, SES, MES, tail indices, ...</p> <p>Structural macro models</p>

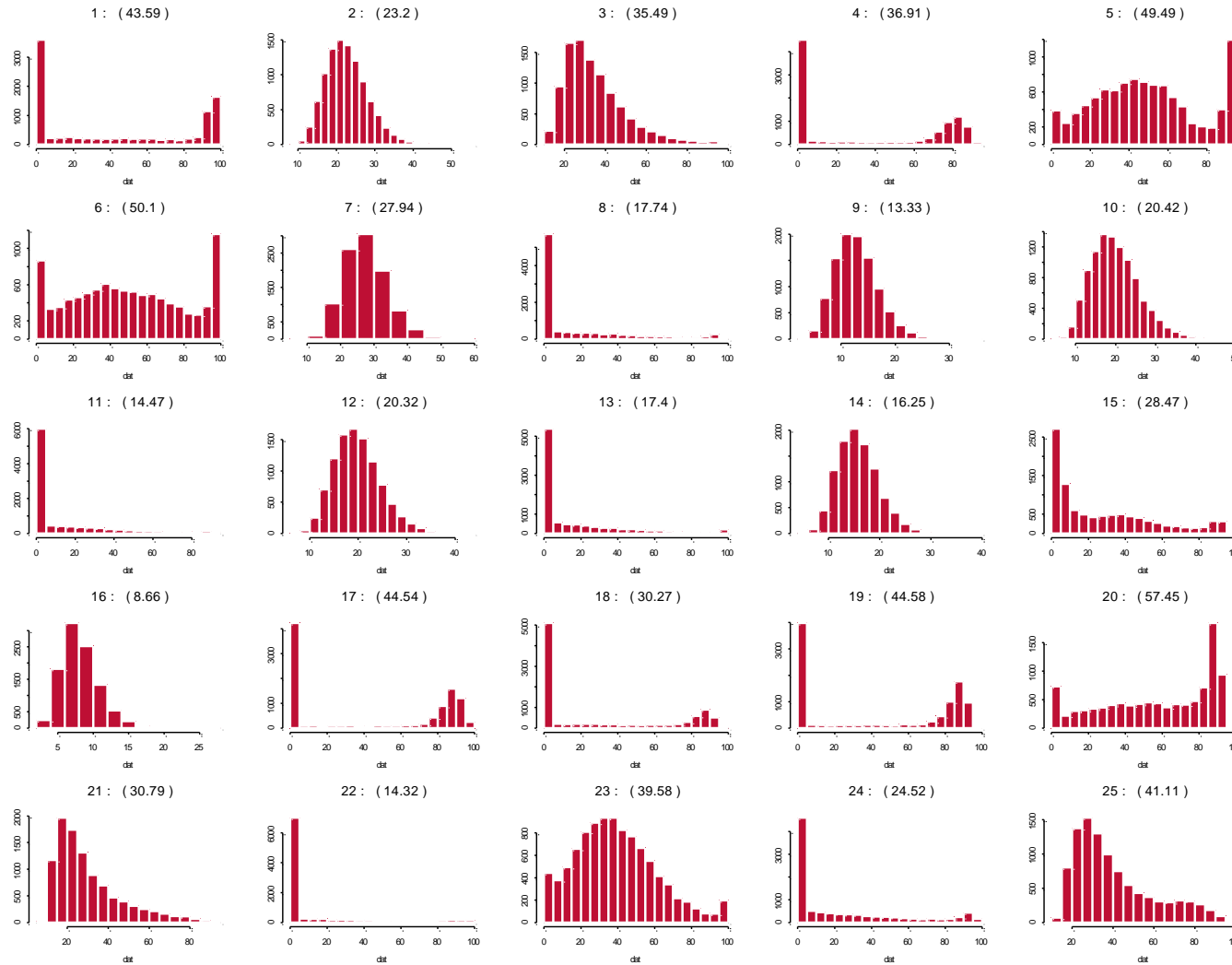
# An example of asset-level heterogeneity

LOAN # 40



LOAN # 98

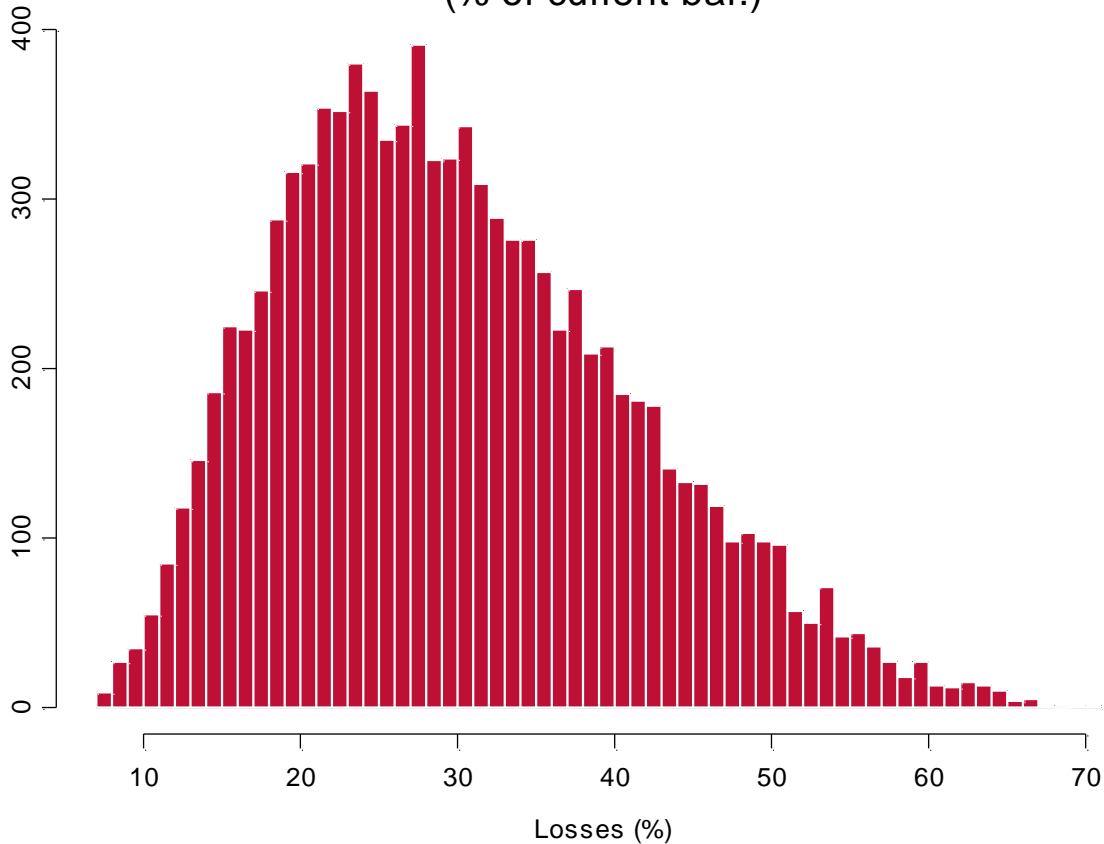
# Example (cont): Simulated losses for 25 bonds (% of current balance)



(See Chinchalkar, S. and R. M. Stein, Comparing loan-level and pool-level mortgage portfolio analysis, Working Paper, Moody's Research Labs. [www.moodyresearchlabs.com](http://www.moodyresearchlabs.com) for a discussion.)

# The full portfolio

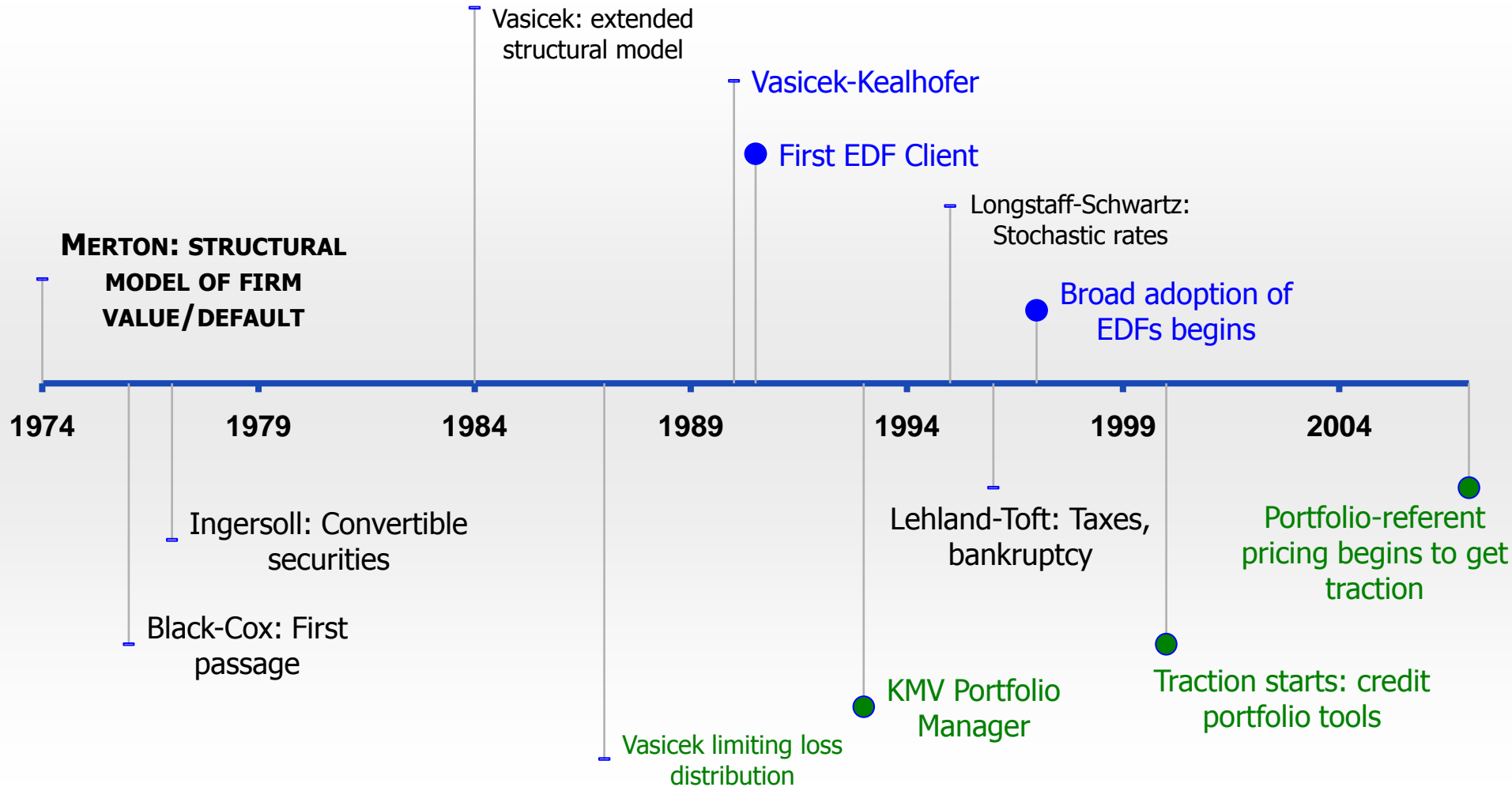
Simulated loss distribution for 25 RMBS tranches  
(% of current bal.)



## Summary statistics:

- EL: 30.0
- Median loss: 28.6
- Modal loss: 23.5 (approx)
- SD(losses): 11.1

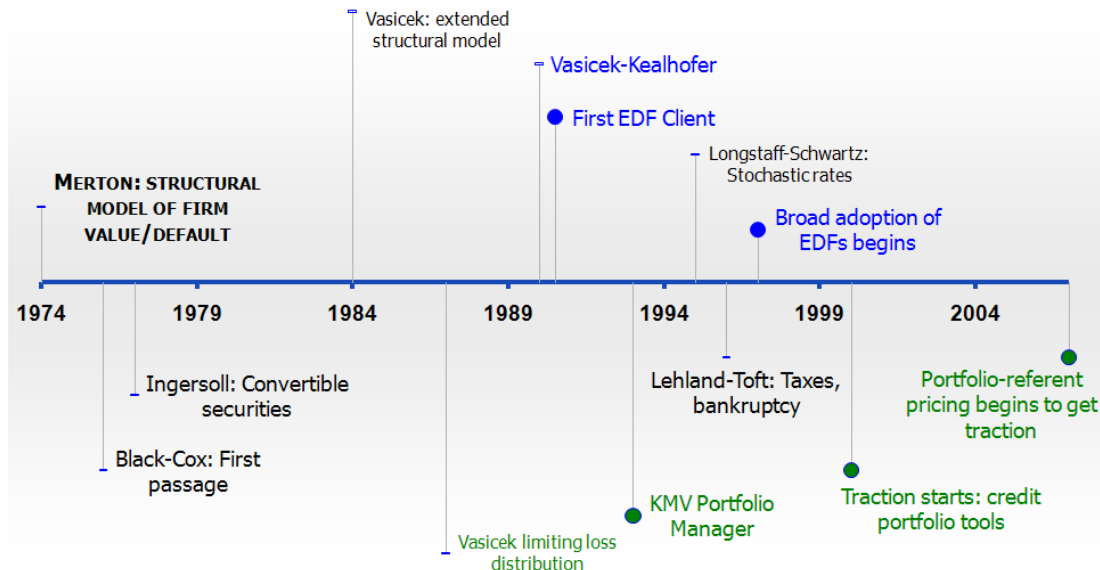
# Pace of adoption of *credit* portfolio analytics (stylized)





# Historically, for credit risk, each phase of adoption took the better part of a decade (stylized)

- First theory → first commercial adoption: **16 years**
- First EDF → traction: **7 years**
- First portfolio tool → traction: **7 years**
- Portfolio tool adoption → interest in port. referent pricing: **7 years**



# Logistics, technology and organizational issues can create impediments

- Uptake of simpler tools that can be rolled out gradually is more rapid.
- Uptake of complex models that **require broad buy-in from across bank can take a very long time** – particularly if they affect compensation.
  - Anecdotally, as of 2009, only about 1/3 of major banks reported using concrete transfer pricing (i.e., line risk takers are charged for capital usage). Though adoption continues, about half did not report doing any form of formal transfer pricing. (Lower in the US, higher globally.) - IACPM
- **This suggests that initial descriptive measures may lay the groundwork for more realistic and normative ones that are informed by richer data sets.**

See Bohn, J. B. and R.M. Stein (2009), *Active Credit Portfolio Management in Practice*, Wiley, for a discussion.

# Systemic risk attribution may be more challenging due to externalities the and low visibility of rare benefits

	CREDIT TRANSFER PRICING AT BANK	SYSTEMIC RISK ATTRIBUTION (TAX? CAPITAL?)
<b>Price structure</b>	Pay for each <b>unit of bank capital</b> used by originating a new exposure	Attribute <b>unit share</b> of systemic “cost”
<b>Transfer Price source</b>	Capital model (MES, RC,TRC),CDS, etc. • Which model/price?	CoVaR, MES, etc. • Who calculates? • Which models? • How allocated (Acharya, <i>et al.</i> ? Shapley?, etc.)
<b>Reference portfolio</b>	• Bank or BU (sub)portfolio	• Bank or BU (sub)portfolio • Portfolios of other banks • Who chooses cohorts?
<b>Price dependency</b>	• Next trade • Bank’s current portfolio	• Next trade • Bank’s current portfolio • Other banks’ current portfolios (!)
<b>Benefits</b>	• Better capital allocation (reduced captl) • Reduced risk of cashflow disruption • Higher valuation of bank? (in exp.)	• Reduced risk of market disruption (in expectation) • More liquid markets (in expectation)

## Concluding thoughts

- **Data collection is very important but very hard**
  - Analytic aspirations should guide but not limit data collection
  - Issues of confidentiality and heterogeneity may loom large
- **Industry and academic participation is key**
  - Deep insight
  - Faster adoption
- **Analytics should be developed with an eye towards a coherent frameworks rather than as stand-alone measures**
  - Early (possibly coarse) attempts can begin earlier
  - Integration of analytic approaches will be required
- **We should expect to be (very) patient along most relevant dimensions**
  - Data may be slow in arriving
  - Adoption may be slow
- **Agency and “fairness” issues may be challenging**

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Some thoughts on data

## Some observations on building and managing data consortia for analytics development

- There is a tendency to relegate data collection, cleaning and aggregation to the status of an implementation detail.
- It is useful to consider that:
  - Defining fields  $\neq$  Conforming data
  - Submitting data  $\neq$  Participating in consortium
  - Data collection  $\neq$  Pooling data
- Data aggregation is largely **not** a technology issue.
- Many institutions cannot generally pool much of *their own* internal data meaningfully.
- Without active dialog with contributors, collected data becomes a jumble.

See Bohn, J. R and R.M. Stein (2009), Active Credit Portfolio Management in Practice, Wiley, for a discussion.

## Aggregating data for systemic risk is different

- Much broader scope than, e.g., prices or defaults (a bit closer to collecting private financial statements, but more complex).
- Many more relationships between data elements and reference entities required.
- Much deeper semantics and ontology.
- By definition, institutions cannot do this independently.
- However coordination is difficult... (see previous slide).
  
- **Without active participation by industry members, it is unlikely that data efforts will produce outcomes that maximize their potential.**

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