CBRE ECONOMETRIC ADVISORS Presents

NEW LANDSCAPE

CBRE AMERICAS RESEARCH CONFERENCE 2017

THE PROFESSORS

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SEPTEMBER 15, 2017

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WHEN ROBOTS COME TO TOWN: WHAT DOES AUTOMATION DO TO LOCAL INDUSTRIAL SPACE MARKETS?

William Wheaton, Ph.D. | CBRE EA, MIT

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INDUSTRIAL ROBOTICS

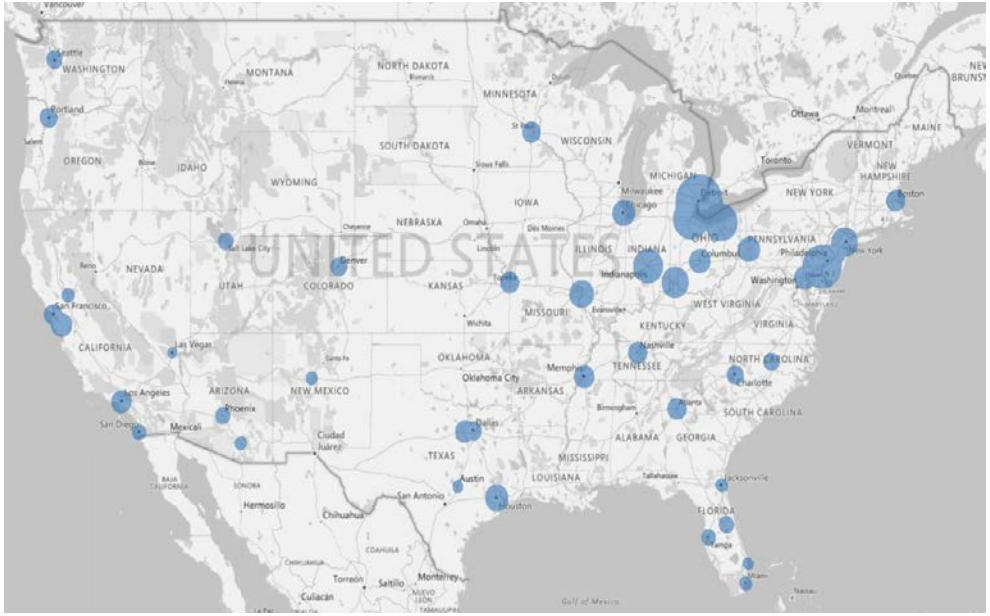
- MANUFACTURED BY NUMEROUS COMPANIES WORLDWIDE
- MUST BE PROGRAMMABLE, TO HANDLE A VARIETY OF TASKS UNDER VARIED CONDITIONS (UNLIKE “CAPITAL”)
- INSTALLATION IS MAJOR ELEMENT: CAN TAKE YEARS
- INDUSTRIAL ROBOT USE IS CURRENTLY CONCENTRATED IN A FEW INDUSTRIES:
  - Autos
  - Chemicals
  - Electronics
  - Glass and Ceramics
  - Metals

ROBOTICS' HYPOTHETICAL IMPACT ON CRE

- LESS/MORE PRODUCTION SPACE IS REQUIRED PER UNIT OF OUTPUT, COMPARED TO WORKFORCE PRODUCTION
- LESS/MORE ANCILLARY SPACE IS REQUIRED FOR INVENTORIES, SPARE PARTS…
- TOWNS WITH ROBOTIC FACTORIES GENERATE LESS/MORE SPACE DEMAND FOR INSTALLERS, PARTS-MAKERS, CONTRACTORS, ETC.
- MORE SPACE DEMAND → NEW FACTORIES, HIGHER RENTS
- LESS SPACE DEMAND → VACANT FACTORIES, LOWER RENTS

ROBOT DATA: INTERNATIONAL FEDERATION OF ROBOTICS (IFR)

Growth of Robots/Worker (1993-2007)



- ANNUAL SALES OF ROBOTS TO INDUSTRY BY COUNTRY—SINCE 1993 FOR EU, 2004 FOR U.S.
- DATA ON LOCATION OF INSTALLED ROBOT(S) IS UNAVAILABLE (PROPRIETARY TO PURCHASERS)
- WE ESTIMATED ROBOT COUNT FOR EACH MSA, BASED ON LOCAL INDUSTRY MIX AND INDUSTRY RATES OF ROBOT ADOPTION
- WE CALCULATED MSA GROWTH IN THE AGGREGATE NUMBER OF ROBOTS PER WORKER (ALL INDUSTRIES): 1993-2007

STATISTICAL ANALYSIS

DOES THE DEGREE OF ROBOT “ADOPTION” IN A MARKET IMPACT:

- CUMULATIVE INDUSTRIAL RENT GROWTH (%, 1990-2007)?
- CUMULATIVE CHANGE IN OCCUPIED INDUSTRIAL SPACE (%, 1990-2007)?
- REGRESSION MODEL RESULTS ACROSS 45 MSAs:

- ONE ADDITIONAL ROBOT PER 1,000 WORKERS (Mean increase: 2.0 robots)
  - *Lowers industrial rent growth by 7-8%*
  - *Lowers occupied stock growth by 6-7%*
- ESTIMATES ARE HIGHLY STATISTICALLY SIGNIFICANT AND ARE **NOT** RESULT OF OTHER CORRELATED INDUSTRIAL SHOCKS
  - *Local IT industrial transformation*
  - *Local exposure to Chinese or Mexican imports*
  - *Local exposure to offshoring of jobs*

WHAT'S TO COME

THE FUTURE SHOULD MIRROR THE PAST IMPACT OF ROBOT ADOPTION ON LOCAL LABOR MARKETS: WATCH OUT FOR AUTOMATION!

- Restrepo and Acemoglu (MIT, 2017) found that robots lower both labor demand (employment growth) and wages
- However, it's difficult to extrapolate such results to robots' broader impact on the general economy, where:
  - *Making and servicing robots generates jobs and factory demand*
  - *Robots' greater efficiency means increases in demand for other goods = increases in labor/space demand*

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BIG DATA AND CRE

Timothy H. Savage, Ph.D. | CBRE EA, NYU

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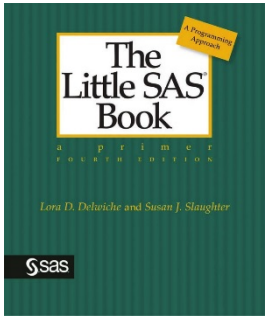
THE NEW DIGITAL LANDSCAPE

- BY 2020, **MORE DATA** WILL BE CREATED IN A SINGLE DAY THAN IN **ALL** OF 2010.
- THE **'DIGITAL EXHAUST'** OF HUMAN ACTIVITY
- IF IT CAN BE **DIGITIZED**, IT CAN BE **ANALYZED**

BIG DATA

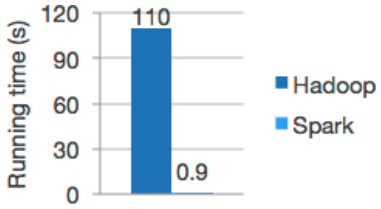
- SCALE, DISTRIBUTION, DIVERSITY AND TIMELINESS
- **DATA** USED TO BE **CHEAP**, BUT **COMPUTATION** WAS **EXPENSIVE**
- **GOOD** DATA IS NOW **EXPENSIVE**, BUT COMPUTATION IS **FREE**



$$\begin{bmatrix} 4 & 7 \\ 2 & 6 \end{bmatrix}^{-1} = \frac{1}{4\times6-7\times2}\begin{bmatrix} 6 & -7 \\ -2 & 4 \end{bmatrix}$$

$$= \frac{1}{10}\begin{bmatrix} 6 & -7 \\ -2 & 4 \end{bmatrix}$$

$$= \begin{bmatrix} 0.6 & -0.7 \\ -0.2 & 0.4 \end{bmatrix}$$



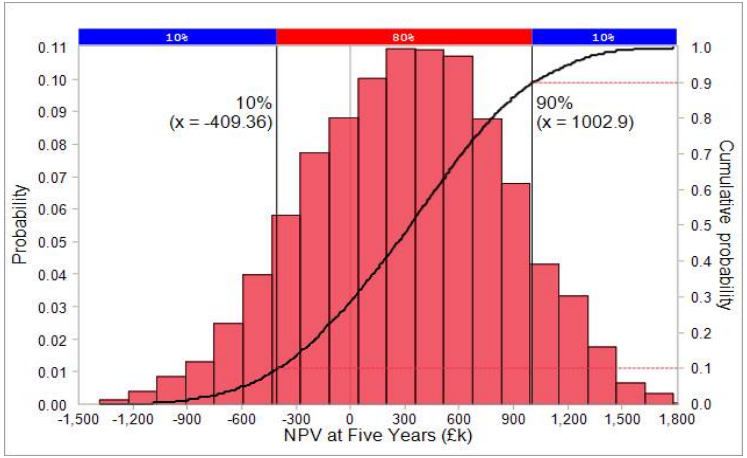

IN CRE BIG DATA IS
WIDE

EXAMPLE: GRANULAR AND ALGORITHMIC SITE SELECTION

- **SUBMARKET** AND **CBD** ARE KEY CRE CONCEPTS
- SITE **SELECTION** AIDED BY DRIVERS SUCH AS **DENSITY**
- GOVERNED BY PRIOR **PERFORMANCE**, SUCH AS **RENT** OR **VACANCY**

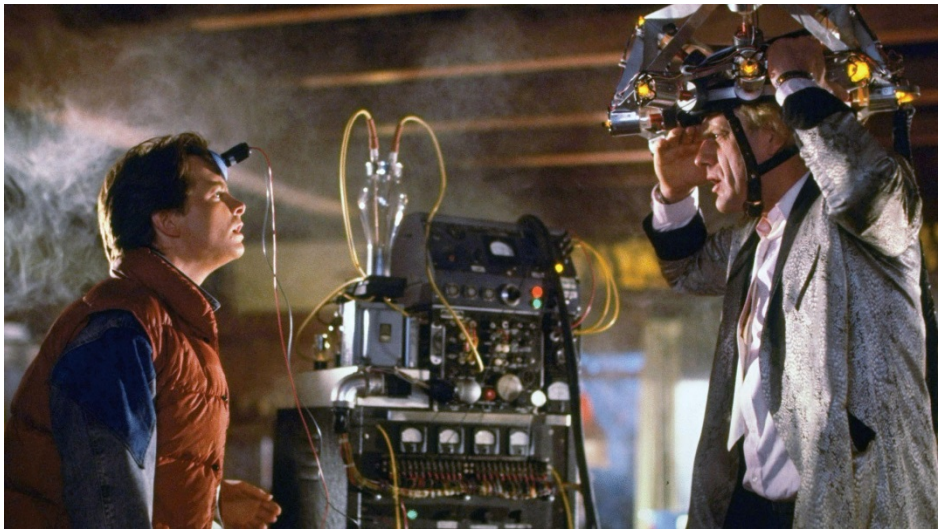
EXAMPLE: RISK MODELING

- **RISK MODELING** ALGORITHMS ARE SIMPLY **SPAM FILTERS**
- PREDICTIVE **POWER DEPENDENT** ON DATA **QUALITY**
- **GREATER VARIETY** AND **VERACITY** = **GREATER** PREDICTIVE **POWER**



BACK TO THE FUTURE: DATA SCIENCE AT EA

- EA **DROVE** DATA SCIENCE **FOR CRE**
- CURRENT **ETL** PROCESS SYNTHESIZES NEARLY **30 DATA SERIES**
- SUBSTANTIVE CHALLENGES **DO NOT** INVOLVE **ARCHITECTURES**



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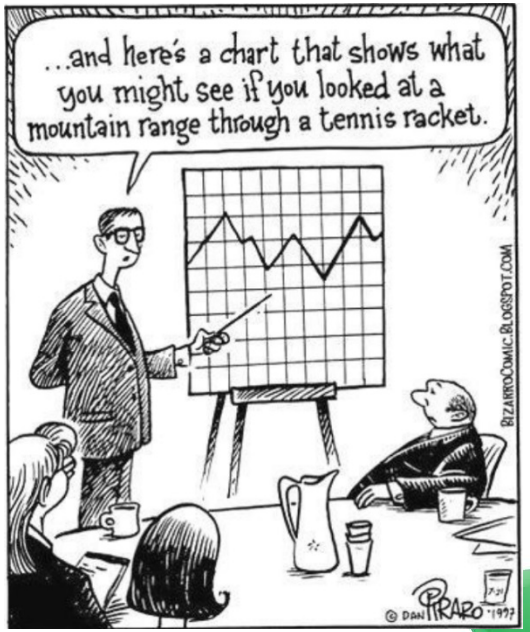
COMMERCIAL REAL ESTATE DATA:
TOWARDS PARITY WITH OTHER ASSET CLASSES



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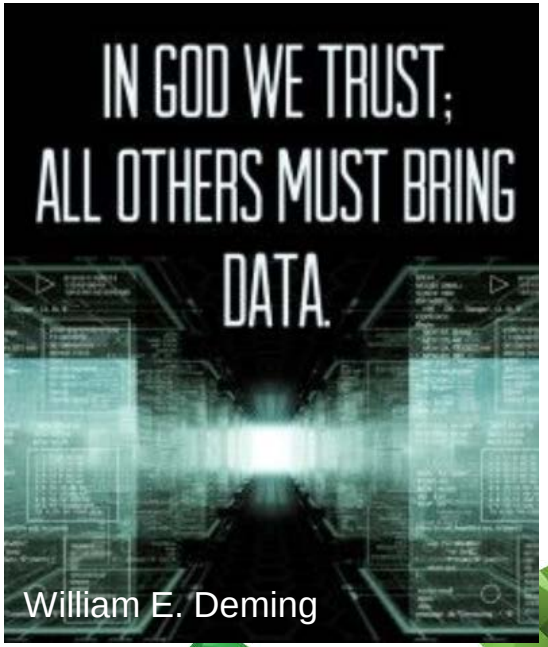
- Comprehensive historical property data?
- What are the barriers?
- Proposal
  - A “merge-clean” tool
  - Data security

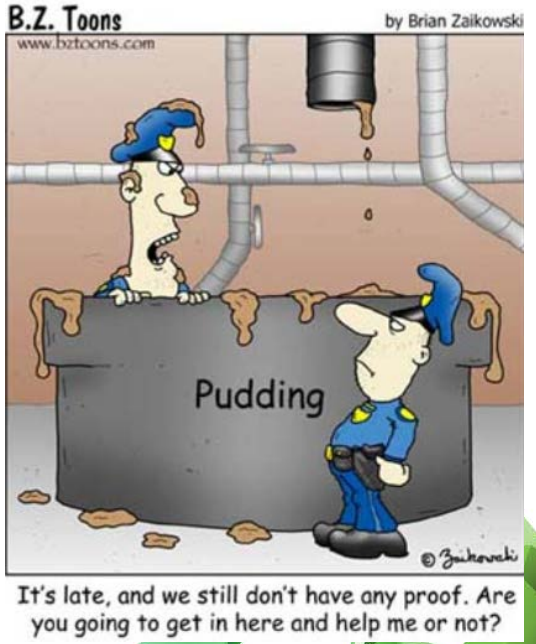


- Pilot study ("Phase I")
  - Multiple data partners
  - Feasibility of merging data sources
  - Consistency of data across overlapping data fields
  - Secure workspace
  - Research Team

- After the pilot? "Phase II"
- Propose to data partners
  - Test models
  - Target Research questions
  - Success = "Phase III"

"Why Gramma, what big data you have!"

- Benefits to stakeholders
  - Data providers
  - Investors
  - Academic researchers
  - Community



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White Paper Available at:
http://uncipc.org/index.php/research-areas/real-estate/

With participation by researchers at:

Columbia University
Cornell University
Massachusetts Institute of Technology
New York University
Pension Real Estate Association
University of Chicago
University of Cincinnati
University of Florida
University of Indiana
University of NC - Chapel Hill
University of Pennsylvania
University of California at Berkeley
University of California at San Diego
University of Texas - Austin
University of Wisconsin

THANK YOU

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