

# 2020 and Beyond: The Future of Insurance

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# The Busy Manager's Guide to Evaluating New Ideas

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## **Fundamental business *problem?***

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## **Fundamental business *objective?***

- Growth
- Profitability
- Risk

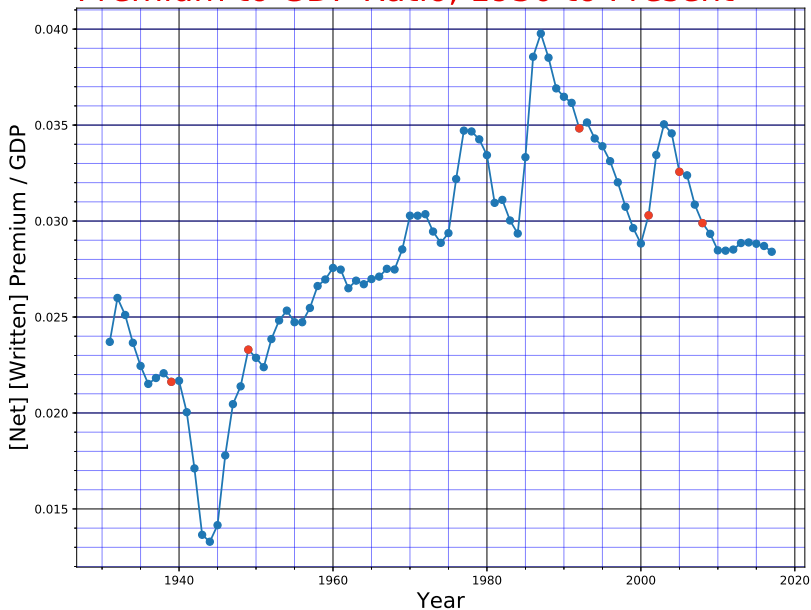
Common to all businesses

# Insurance Today: Looking Forwards by Looking Backwards

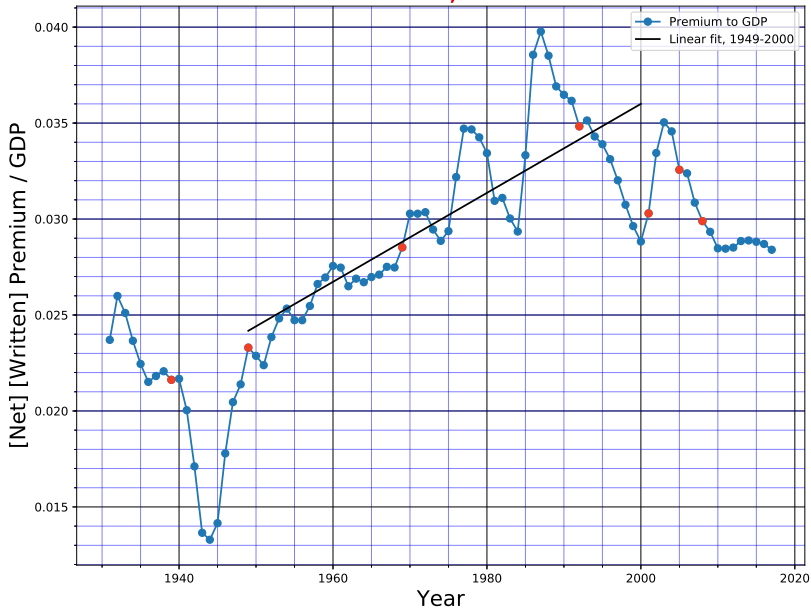
Insurance in the  
Broader Economy



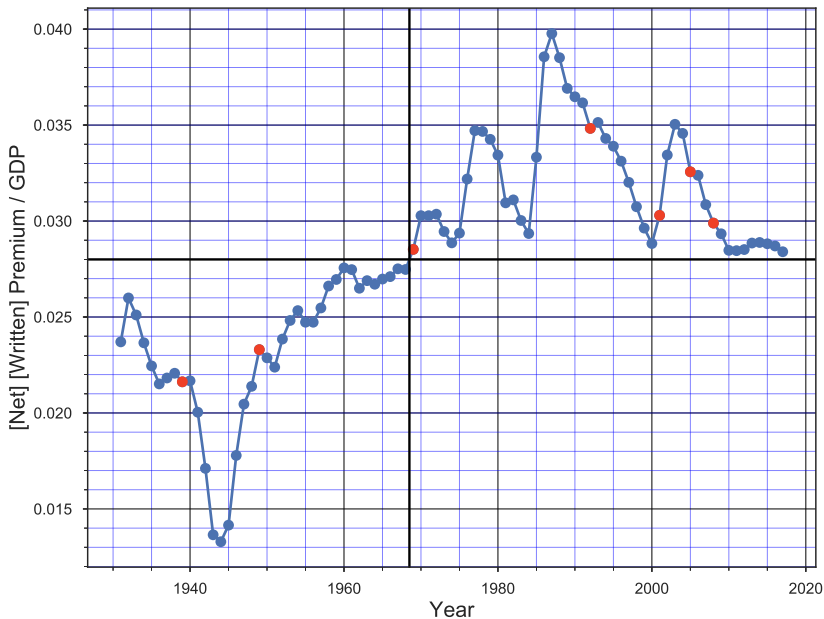
## Premium to GDP Ratio, 1930 to Present



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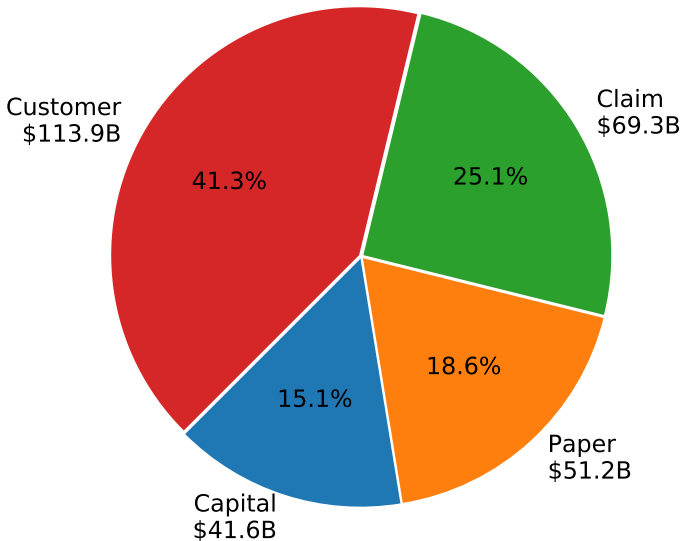


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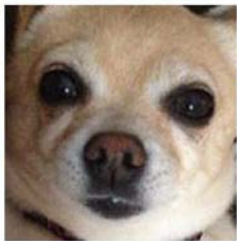
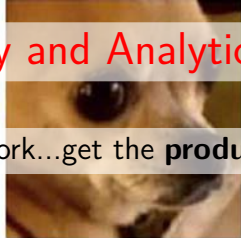


# Insurer Expenses By Value Chain Component



# Technology and Analytics

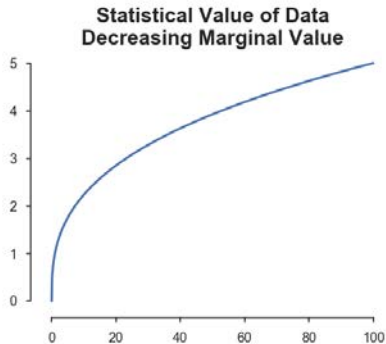
Get **tech** to work...get the **product** right...**liftoff**



# AI Will Be More Important Than Fire & Electricity

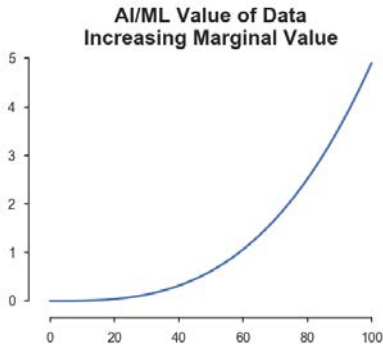
## Statistical models

- Low marginal value of data
- Few experts provide. . .
- Complex inputs



## Machine learning AI

- Increasing returns to data
- Many users provide. . .
- Simple inputs



# Symbiotic Tetrahedron of InsureTech Capabilities

## ...in Search of Problems

<b>Hardware</b> <ul style="list-style-type: none"><li>▪ Mobile</li><li>▪ <b>Cloud</b></li><li>▪ ASIC, GPUs</li><li>▪ Internet of Things (IoT)</li><li>▪ Home sensors</li><li>▪ Auto telematics</li><li>▪ Drones, micro satellites</li><li>▪ Quantum computing</li></ul>	<b>Software</b> <ul style="list-style-type: none"><li>▪ Text analysis, semantics</li><li>▪ Voice recognition</li><li>▪ Chat bots, Siri, Alexa</li><li>▪ Image recognition</li><li>▪ Virtual reality</li><li>▪ <b>Tensor Flow</b></li><li>▪ Hadoop, MongoDo, Redis</li><li>▪ Python, R, Julia, Go</li></ul>
<b>Algorithms</b> <ul style="list-style-type: none"><li>▪ <b>Artificial intelligence (AI)</b></li><li>▪ <b>Machine learning (ML)</b></li><li>▪ Neural networks</li><li>▪ Deep learning</li><li>▪ Hash functions</li><li>▪ Cryptography</li><li>▪ Compressed sensing</li></ul>	<b>Data</b> <ul style="list-style-type: none"><li>▪ <b>Big data (BD)</b></li><li>▪ Text, speech, image, video</li><li>▪ Behavioral data</li><li>▪ Social media</li><li>▪ Spending</li><li>▪ Credit</li><li>▪ Trading, financial data</li></ul>

Get **tech** to work...get **product** right...**liftoff**

# Insurance Opportunities: Real but Defensive

## More granular pricing

- You can't afford to be the company with the **coarsest rating plan**—adverse selection is a real and is an arms race
  - Race to the bottom, CBA or ROI rationale least-bad choice
  - First mover advantage largely gone
- Overly-granular rating plans **undermine the purpose** of insurance
  - Important social questions about appropriate rating variables
  - Important regulatory about price optimization
- Opportunities exist in lines which use proxy data: personal and small commercial
  - Big data less applicable for individually loss rated accounts

## Actuarial optimism

- If you don't keep up you will die. . . **how soon do you want to die?**

# Insurance Opportunities: Real and Positive

## New products and services

- Better KYC and more **effective** underwriting & marketing
- Become the trusted risk partner: 24x7 risk monitoring
  - Home telematics, monitoring and improved design
  - Auto driving feedback: make near-misses real
  - Health insurance nudges
  - Build service income to offset lower loss cost/premium
- Improved claims adjusting process
  - Better fraud detection
  - Improved customer satisfaction
- Learn from near misses—more underwriting information

## Actuarial optimism

- **How long do you want to live?**

# Potential of Technology Varies with Problem Domain

## Stunning Results

- Static, rules based environment
- Clean, direct observations
- Essentially limitless data
- Definitive right answer
- Classification problems
- Simple dynamic control

## Building Capability

- Autonomy

# Potential of Technology Varies with Problem Domain

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## Characteristics of Insurance

- Behavioral feedbacks
- Dynamic: reacts as we learn
- Proxy data, not direct
- Granularity drives small classes
- Uncertain information: claim development, trend
- Latency: asbestos and environmental
- Need to protect social function



# Dangers of AI/ML: We Don't Understand Why It Works



$x$

“panda”

57.7% confidence

+ .007 ×



$\text{sign}(\nabla_x J(\theta, x, y))$

“nematode”

8.2% confidence

=



$x +$

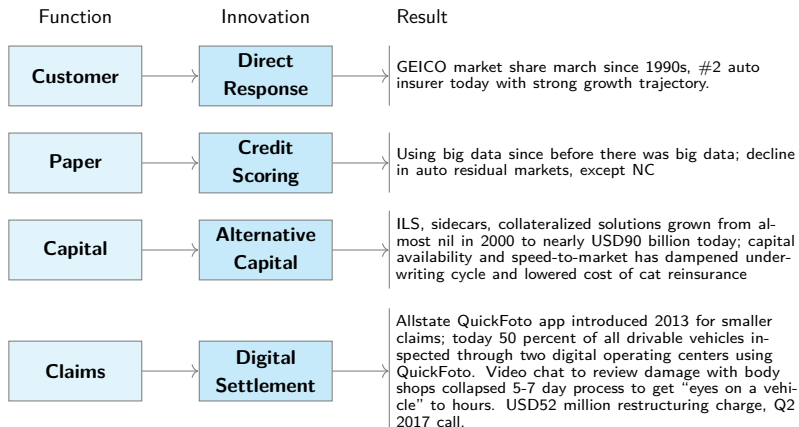
$\epsilon \text{sign}(\nabla_x J(\theta, x, y))$

“gibbon”

99.3 % confidence

- Machine learning is like training your dog: it generally does what you want but you don't know why
- Insurance issues: regulatory compliance, unwitting discrimination

# Insurance: Strong, but Stealth, Record of Innovation



# Driverless Cars

Human-driven cars kill  $\approx 37000$  people per year in the US







Auto drives **45 percent** of global property casualty premium

Auto lowers industry volatility by **30 percent...**

...and creates over **USD100 billion** capital capacity for other lines



Social Trends

# RUSSIA HACKING THE ELECTION



ENC CIPHER AUTH  
IPAZ CCMP PSK  
IPAZ CCMP PSK  
PA PSK  
IPAZ CCMP PSK  
IPAZ CCMP PSK



EQUIFAX

What if We Could Engineer a Trust-Machine...

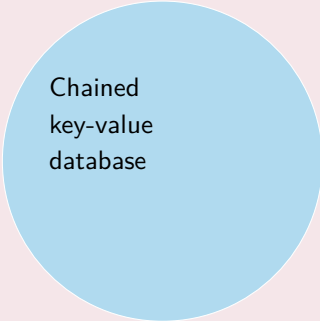
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The Blockchain: enabling trust between strangers



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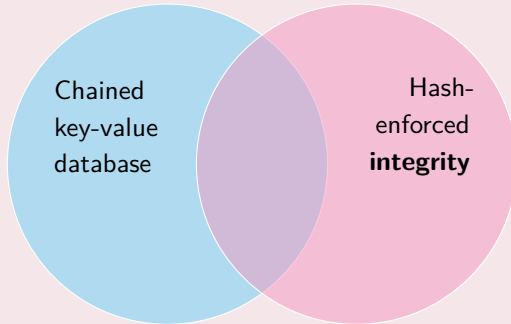
The Blockchain: enabling trust between strangers



Chained  
key-value  
database

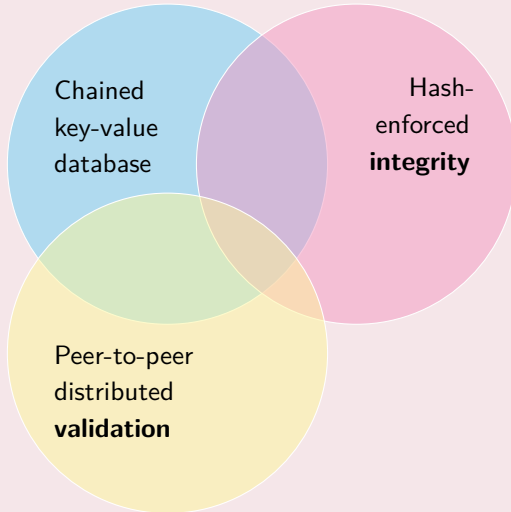
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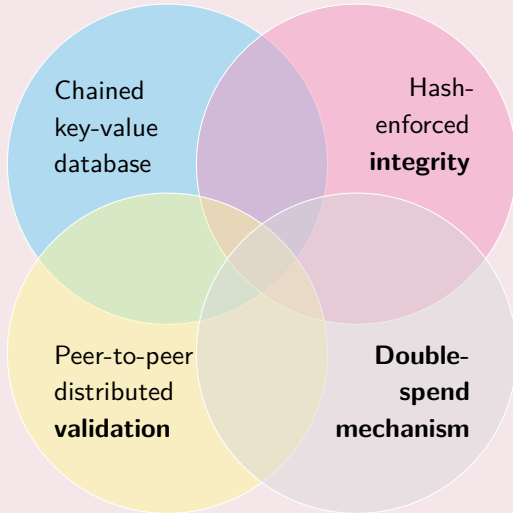
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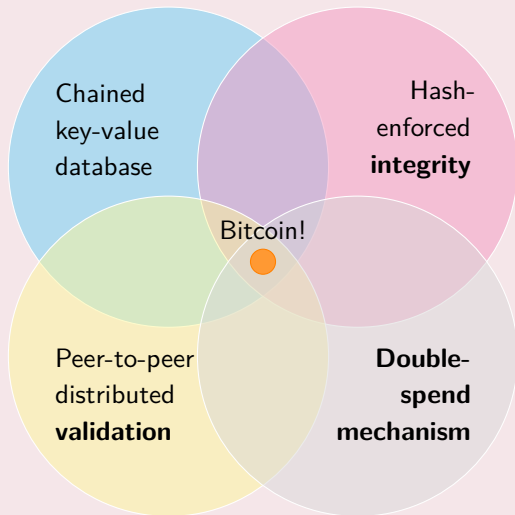
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## The Blockchain: enabling trust between strangers



# Blockchain Fills the Trust Vacuum

## Reclaim personal ownership of personal information

- It is possible to **verify** information without **revealing** it: a **zero knowledge proof**
  - Where's Waldo? with a mat; Alibaba's Cave
- Distributed database of all private credit, health, behavioral data
  - One-time **read/verify-only** access
  - Read, **act** and **forget**, rather than read, act and **store**
  - User **cannot pass along** what they've learned
  - Transferable, international credit history, Bloom Credit
  - No possibility of Equifax hack: data encrypted, you hold keys
  - Smart contracts, DAO = decentralized autonomous organization
- Central database of underwriting information: easier bindable quotes
  - Theoretic potential is huge but commercial model less clear

# Economic Trends



# New Economic Reality Generates New Opportunities

## Major opportunities

- **Cyber risk:** front-runners see on-going risk advisory service bundled with meaningful indemnity back-up
- **Gig economy** coverage gaps, e.g. Uber driver coverage, AirBnB

## Minor opportunities

- Peer to Peer
- Pay-as-you-Go/Use/Need
- Toy and trinket coverages
- Purchasing groups, Bought by Many



# Prognosis



## Prognosis: Challenges, but Net Opportunity

Trend	Problems			Objectives			Net
	KYC	AS	MH	Grow	Pft	Risk	
Environmental	●	●	●	●	●	●	Opportunity
Demographic	●	●	●	●	●	●	Opportunity
Tech, Analytics	●	●	●	●	●	●	Opportunity
Driverless Cars	●	●	●	●	●	●	Threat
Social	●	●	●	●	●	●	Opportunity
Economic	●	●	●	●	●	●	Opportunity

KYC: know your customer

AS: adverse selection

MH: morale hazard

Pft: Profitability

● positive

● neutral

● negative

# Predictions: The Insurer of the Future Will...

- Update systems to unleash full power of data and analytics
- Scale risk bearing capacity for mega-cats
- Be a 24/7 risk advisor
- Profit from the trust vacuum



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**About the Speaker:** Stephen Mildenhall is an Assistant Professor in the School of Risk Management, Insurance and Actuarial Science at St. John's University in New York. He was previously Global CEO of Analytics for Aon plc, based in Singapore, and head of Aon Benfield Analytics. Prior to joining Aon, he worked at Kemper Insurance and CNA Insurance. Stephen has an undergraduate degree in Mathematics from the University of Warwick, England, and a Masters and Doctorate in Mathematics from the University of Chicago. He is a Fellow of the Casualty Actuarial Society, an Associate of the Society of Actuaries, a Chartered Enterprise Risk Analyst (CERA) and a Certified Specialist in Predictive Analytics (CSPA). His research interests include risk theory, capital determination, allocation and optimization, and applications of statistics to reserving and ratemaking. He is a two-time winner of the CAS Woodward-Fondiller prize for the best research paper by a new fellow of the CAS.

