

Expanding Actuarial Expertise in Asia

Professor Shaun Wang, Ph.D., FCAS, CERA
 Director, NTU's Insurance Risk and Finance Research
 Centre (IRFRC)
 Associate Director, IFoA's Actuarial Research Centre

IFoA Asia Conference 2016, March 3-4, Kuala Lumpur

Challenges and Opportunities for the Actuarial Profession

- Actuaries face competition from accountants, statisticians and financial engineers
- What is unique about actuaries?
 - Regulation Requirement
 - *Actuarial* Valuation of Products and Business Models (**unique approach?**)
- Who do actuaries serve?
 - Employers vs. General public

Actuaries are Needed to Bridge the Insurance Protection Gap in Asia

Growing Demand

- Growing middle class in Asia
- Ageing and growing need for saving products
- Environmental protection
- Health insurance and wellness
- Financing of natural disasters

Supply-side

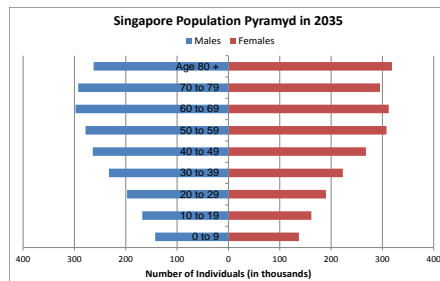
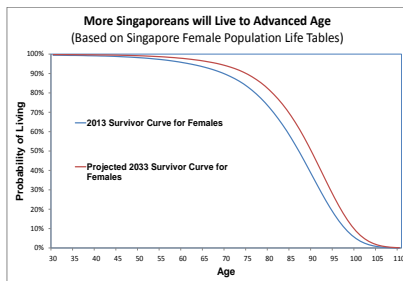
- Design saving and investment products for the long-term
- Wellness programme
- Financial incentives for environmental responsibility and social justice
- Improve reputation of insurance industry
- Professionalism of actuaries

3 March 2016

Dr. Shaun Wang

3

Increased Longevity, Reduced Fertility and Ageing Society: Singapore



Proportion of Singles Among Females			
Age Group	2004	2014	Ratio
25 to 29	47%	64%	1.4
30 to 34	21%	27%	1.3
34 to 40	16%	18%	1.2

3 March 2016

Dr. Shaun Wang

4

Growing Need for Investment Actuaries

- Asian culture: in favor of investment saving
- Design and promote long-term saving/investment products
 - With consumers in mind
 - Simple and transparent products, please!
- From ALM to Dynamic Hedging Program
 - Require actuaries who understand both assets and liabilities
 - Huge potential in developing Asia's capital markets

3 March 2016

Dr. Shaun Wang

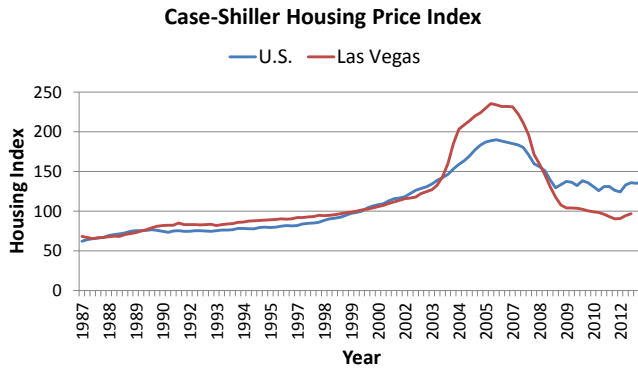
5

Actuarial Valuation Services: Housing Markets

1. We construct an actuarial housing value that incorporates a broader set of economic and demographic factors.
2. The resulting actuarial housing value is shown to be less volatile than market value, and more representative of housing's sustainable value.

A Practical Question

For mortgage lenders, traditional loan-to-value metrics can be unreliable.
For example, 80% loan-to-value in June 2006 became 112% (or 184% in Las Vegas) loan-to-value in June 2010



Use Quarterly Change of Housing Price Index (HPI) Caps and Floors to construct Actuarial Values

$$QC(t) = \frac{HPI(t)}{HPI(t-1)} - 1$$

$$\overrightarrow{QC(t)} = \{QC(t-j), \text{ where } j = 0, 1, \dots, 39\}$$

$$Cap(t) = E[\overrightarrow{QC(t)}] + \sigma[\overrightarrow{QC(t)}] - drift$$

$$Floor(t) = E[\overrightarrow{QC(t)}] - \sigma[\overrightarrow{QC(t)}] - drift$$

The Quarterly Housing Price Change is controlled
within the range of [Floor(t) , Cap(t)]

$$AQC(t) = \max\{Floor(t), \min(QC(t), Cap(t))\}$$

Data Used to Construct Actuarial Values

Data	Data Source
Case-Shiller Index	S&P
Housing Market Inventory Supply	Zillow
Foreclosure Home % in Transaction	Zillow
Newly Applied Building Permit	Census Bureau & Texas A&M University
Housing Inventory	Zillow
Construction Cost	Marshall & Swift/Boeckh
Demographic Information	U.S. Census Bureau
Households with Age Information	U.S. Department of Housing and Urban Development
Household Income at Zip Level	Internal Revenue Service
U.S. Household Formation	U.S. Census Bureau
International Sale in Housing Market	National Association of Realtors
Mortgage Loan Standard	Ellie Mae Origination Insight Report
House Price at Zip Level	Zillow

Calibration of Drift Term

Calibrate by minimizing sum squared error:

	Calibrated Drift Term
Chicago	0.003
Washington	(0.003)
Detroit	0.012
Las Vegas	(0.005)

Further adjust for economic and demographic factors by metropolitan area

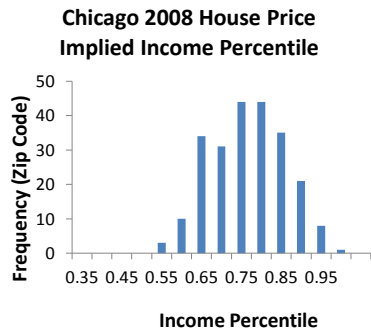
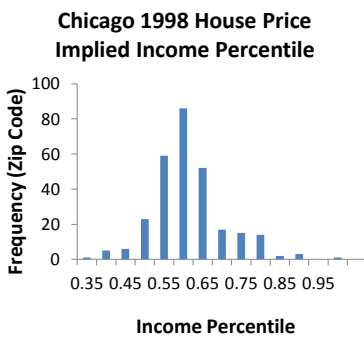
Migration Outflow

From 2000 to 2008, among eight metropolitan areas, Detroit is the only one which experienced a net population decrease due to the high negative net migration.

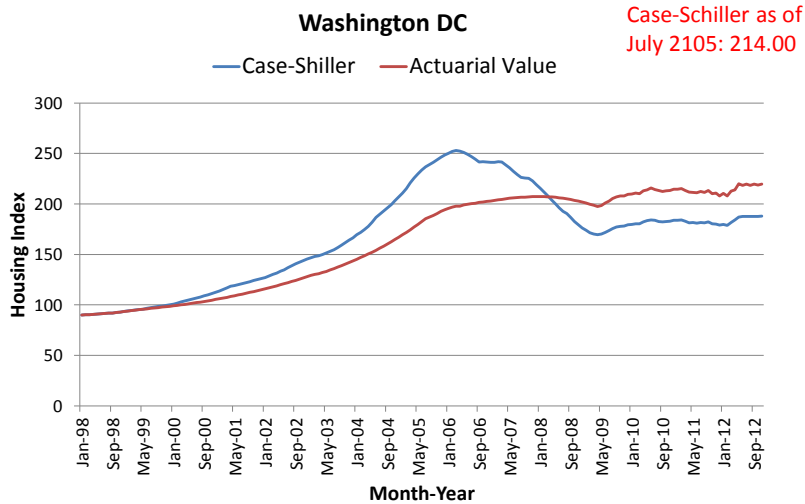
	Chicago	Detroit	Houston	Las Vegas	Los Angeles	Phoenix	Tampa	Washington DC
2000 Population	9,098,629	4,452,558	4,715,417	1,375,535	12,365,624	3,251,887	2,396,011	4,796,065
2000-2008 Net Migration	(119,923)	(237,573)	468,210	380,112	(420,191)	717,353	328,419	137,771
2000-2008 Population Change	470,995	(27,448)	1,012,726	490,211	507,184	1,030,012	337,750	562,065
2000-2008 Population Change %	5.2%	-0.6%	21.5%	35.6%	4.1%	31.7%	14.1%	11.7%

Household Income Distribution

We have found that a higher percentile (e.g. 65%) of the income distribution is a better metric than the median (50%) to match with transacted house prices.



Washington DC Housing Actuarial Value



Actuarial vs. Market Valuation of Oil

- Students were asked to put Saudi Arabia Oil Reserves on its balance-sheet on 12/31/2010.
 - Oil Reserve = 230 billion barrel
 - Oil Annual Production = 3.5 billion barrel
- What asset value to put on the balance-sheet?
- What potential impacts on the earning for Saudi Arabia due to oil price fluctuation?

Accounting Volatility of Using Market-to-Market of Saudi Oil Reserves

Project 2011 Accounting Earnings due to MV change (\$ billion)	
5 th percentile	(9,490)
25 th percentile	(1,371)
50 th percentile	3,504
75 th percentile	10,590
95 th percentile	18,731

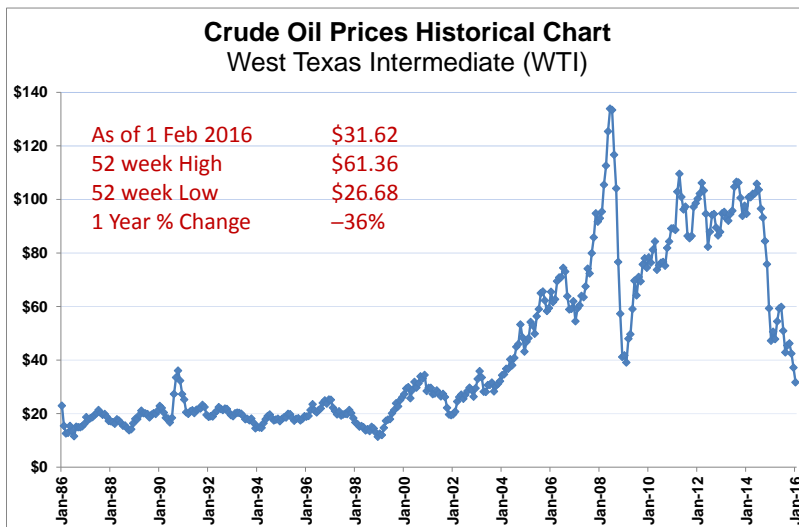
Project 2011 Revenues from Production (\$ billion)	
5 th percentile	246
25 th percentile	308
50 th percentile	345
75 th percentile	399
95 th percentile	461

3 March 2016

Dr. Shaun Wang

15

Historical Price of Oil



3 March 2016

Dr. Shaun Wang

16

Appraisal of Business Models

- Sustainability of Saudi Arabia government spending program?
- “Implications” of prolonged low oil price on some countries
 - Will oil trade continue to be tied to U.S. dollar?
- Actuarial appraisal of “quantitative easing”
 - Can actuaries create a broad-based index as “stabilizer”?

3 March 2016

Dr. Shaun Wang

17

Appraisal of Insurance Products & Business Models

- Elicit the value of insurance to consumers
 - How much commission would be fair?
 - What loss ratios are reasonable?
- Appraisal from *business model* viewpoint:
 - reverse mortgage products
 - long-term care products
- Government’s role in agriculture insurance
- Mutual Insurance Model and Co-Operatives
- Wellness program and health insurance

3 March 2016

Dr. Shaun Wang

18

Professionalism is the key!

- Actuaries need to communicate better to the public and policy-makers: **Insurance is stabilizer!**
- Insurance industry need to self-regulate market conducts to improve reputation
- Actuaries can help improve the “image”, by putting the public good in the equations of appraisal of products and business models