Testimony of Paul H. Brewbaker, Ph.D., CBE

on

PROPOSED AMENDMENTS RELATING TO HAR CHAPTER 15-218
"KAKAAKO RESERVED HOUSING RULES"

May 17, 2017

Thanks again for this second of three opportunities this month to testify on aspects housing economics and inclusionary zoning policy (IZ) prompted by an HCDA proposal to change its affordable (the adjective) housing (the common noun) production quotas, buyback rules, and shared equity requirements to parallel more closely similar changes being considered by the City & County of Honolulu. In my testimony earlier this month I made several observations which I summarize in the next paragraph for the written record. I appear today at the request of several area residential developers with whom I am engaged in consultation to provide an economic analysis of the proposed HCDA policy changes. I plan to make a report on my findings available to HCDA next week and, at the end of the month, will return to offer my three-minute conclusion in testimony at that time.

To recapitulate, my six observations on May 3, 2017 were: (1) reducing HCDA's reserved housing adjusted median income (AMI) thresholds will result in less new housing development, not more, as will increasing production quotas as a fixed fraction of proposed new units; (2) restricting homeowners' leverage (not to exceed 80 percent of *original* purchase prices and, presumably, a declining fraction of future valuations) will undermine households' financial flexibility, deter reinvestment in depreciation mitigation, and may undermine mortgage underwriting and securitization; (3) replacing an American (fixed term) buyback option with a European (perpetual) option encumbers more heavily future values of the underlying asset; (4) prior ownership restriction changes on HCDA reserved housing applicants may simply be an invitation for families to game the system; (5) equity sharing may comprise an unconstitutional taking which, if not in violation of housing anti-discrimination principles (in outcome, if not intent), put the state (small *s*) in the unethical position of profiting on private individuals' equity investments;[1] and (6) using median existing Oahu home prices as an indexing mechanism ignores higher-order moments of the underlying home price distribution and their potentially pernicious effects.[2]

[1] Presumably, in social democracies, the wealth transfer would go in the opposite direction, *from* a polity comprising the public at large, *to* individuals and their families whose housing needs cannot be fulfilled because of their low incomes or other economic disadvantages, rather than from poor households to the state (small s).

[2] The resulting distortion might be diminished by using a quality-adjusted price index that relies on broader public-record data such as collateralization amounts underlying mortgage-backed securities, in the spirit of a Case-Schiller index, such as one of the Federal Housing Finance Administration's house price indexes, in addition to transactions-based data.

I was once "schooled" by Stanford University Economics Professor John Taylor, after whom the Taylor Rule of monetary policy is named, when he was U.S. Undersecretary of Treasury for International Monetary Affairs and I was a commercial bank economist debating exchange rate policy with him in an industry roundtable. His observation was, "perhaps you haven't been keeping up with the literature." *Boom*. In this spirit of collegial critique, let me survey what the housing economics literature says about inclusionary zoning.

First, the housing economics literature is unkind to inclusionary zoning policy. To paraphrase a recent UHERO literature review, inclusionary zoning is a policy fail.[3] It yields less housing, and less affordable (the adjective) housing. In jurisdictions like Oahu, geographic constraints ("steep slopes and water bodies")[4] complement regulatory constraints to reduce the responsiveness of new housing supply to changes in demand. This yields more volatile prices and valuation cycles of greater amplitude than in places where towns spatially can radiate outward across the flat prairie and where regulatory burdens are minimal. Honolulu and Hawaii distinctively appear in every empirical quantification of regulatory scarcity at the top of U.S. national rankings as the most costly places to build, by far, *because of these constraints*.

Second, even among my colleagues in what I call "the ULI crowd," the evaluation of inclusionary zoning is mixed at best. A number of papers, including consultants' studies posted on the City & County of Honolulu's web site, conclude their evaluation of the success rate for inclusionary zoning with a resounding "*Meh*." It works some places, it doesn't others, offering little guidance beyond that mediocre assessment. I conjecture that the places IZ doesn't work most likely have "steep slopes and water bodies" and face a housing regulatory environment notorious as most burdensome nationwide. Even Honolulu's konohiki of TOD, Harrison Rue, observed (somewhat cavalierly) at the last HCDA public hearing that he can get a 120 percent AMI required to work down on Ala Moana (Boulevard). That is the point, isn't it: IZ works as long as you are building luxury condominiums down on Ala Moana Boulevard. Not so much up on Beretania where local families are more likely to live.[5]

Third, ironically, IZ *obligates* developers to build luxury housing units. Only high prices can cross-subsidize the low-cost housing units developers are obligated to build under IZ production quotas. This is why IZ fails: if you *have* to build high-end units to build *any* units (since only high-end units will cross-subsidize the low-end units), then you will never build in the middle. *We all live in the middle*.

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[3] Carl Bonham, Kimberly Burnett, Andrew Kato (February 12, 2010), "Inclusionary Zoning: Implications for Oahu's Housing Market," *UHERO Project Report 2010-1* (http://www.uhero.hawaii.edu/assets/UHEROProjectReport2010-1.pdf), who write, "Inclusionary Zoning (IZ) policies have failed in other jurisdictions and are failing on Oahu. IZ reduces the number of 'affordable' housing units and raises prices and reduces the quantity of 'market-priced' …units."

[4] Andrew Paciorek (December 2011), "Supply Constraints and Housing Market Dynamics," *Federal Reserve Board Finance and Economics Discussion Series WP 2012-01* (https://www.federalreserve.gov/pubs/feds/2012/201201/201201pap.pdf), published as (2013), "Supply Constraints and Housing Market Dynamics," *Journal of Urban Economics*, vol. **77**, pp. 11-26

[5] As evidenced by the *thousands* of new housing units under urban redevelopment along the King Street / Beretania corridors as we speak. OK, I'm being sarcastic. Currently I know of *none*.

Fourth, HCDA current and proposed policies require that *only the new guy* has to pay a tax to subsidize low-end housing. Old guys, some in red t-shirts, and the public at large, simply free-ride off the new homebuyers. This is odd redistribution policy construct. Need a new school? Make the new guy pay. Fire Station? The new guy. TheTrain station? "Woah nelly, *us old guys no pay for notting*."

The higher the production quota, or the lower the AMI threshold, the *more* luxury units a developer has to build to fulfill its quota, and the fewer new units will be built for regular people who live in the middle of the housing price distribution. This is upside-down. I can statistically demonstrate, in a plausibly specified long-run framework, that beginning with housing policy changes adopted in the 1970s that included the creation of the Kakaako Redevelopment Authority, HCDA's precursor, and the embrace of IZ policies in the 1980s, subsequent homebuilding on Oahu contracted from one residential investment cycle to the next over the last four decades. (See Figure 1, appended). Once Honolulu exhausted most urbanizable land in proximity to the urban core during the late-20th century, regulatory restrictions incrementally constrained—in each consecutive cyclical recovery—subsequent new housing *flow* supply responses. Never in the last half century (between 1956 and 2016) have there been fewer new housing units authorized by building permit on Oahu in any eight continuous years *than during the last eight years*.

Next time I will offer a constructive alternative to the proposed HCDA policy changes involving a measured *reduction* to regulatory barriers to entry for development of new housing units priced in lower quantiles of the distribution of existing home prices. Current IZ policy conflates an income problem (not enough of it) for a housing problem (not enough of it). Let's solve the housing problem.

Mahalo for your time and attention,

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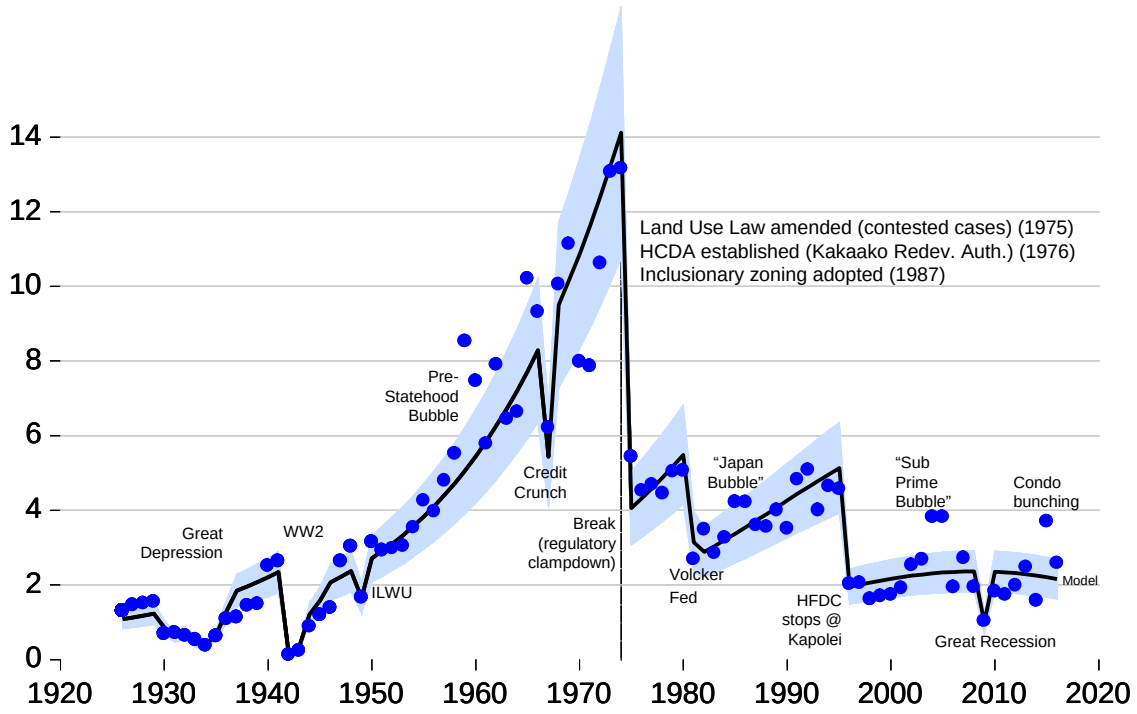
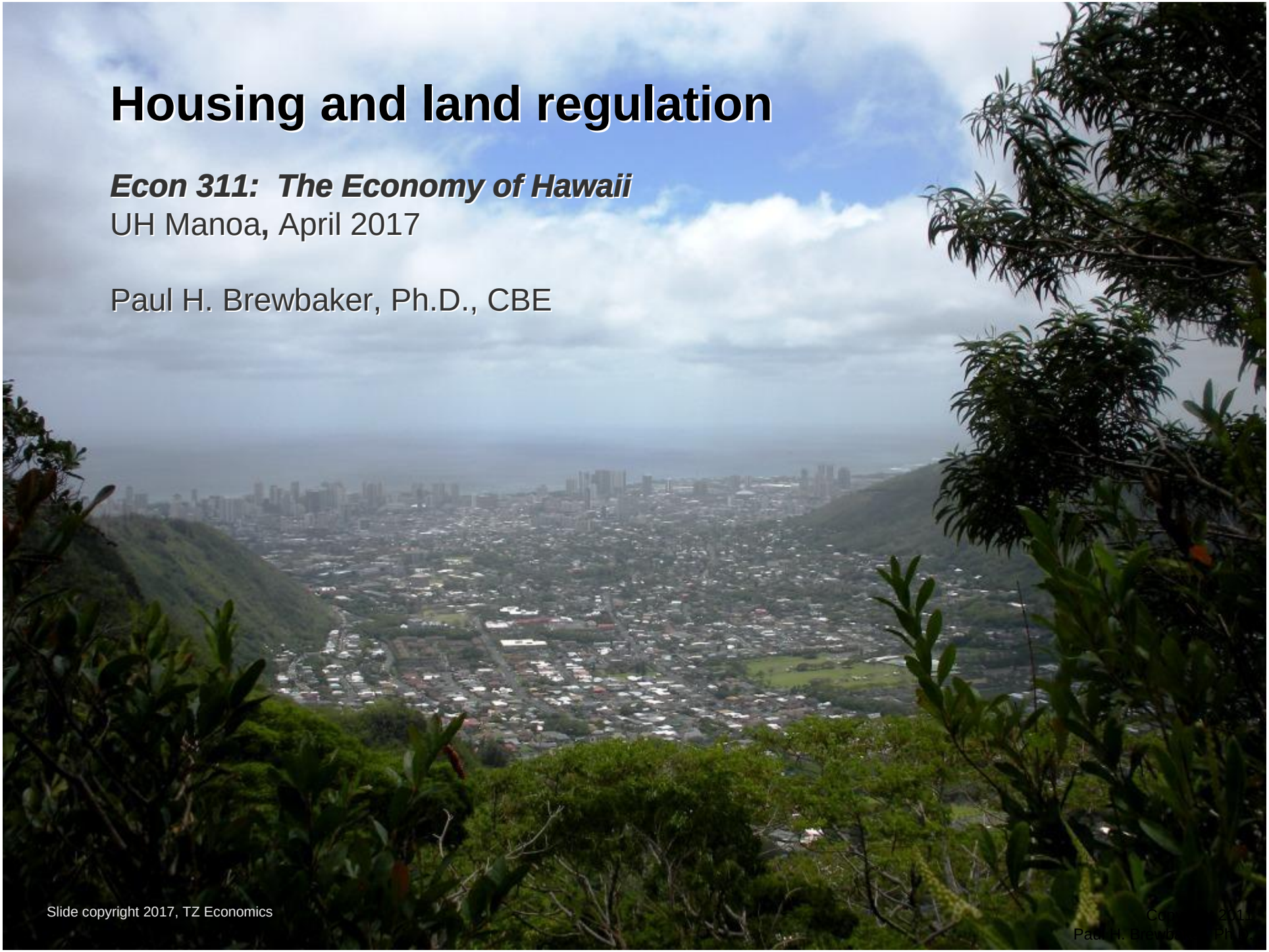
Figure 1. Regulatory constraints are responsible for the break in, and failures to fully recover back to earlier level of, new home construction

New housing units (thousands per year) authorized by building permit on Oahu, and a regression with breakpoints and dummy variables on a low-order polynomial trend component



Path illustrated uses OLS trend regression on third-order polynomial with endogenous breakpoints and dummy variables (calculated from residuals from first-pass regression) for the Great Depression (1930-1936), World War II (1942-45), ILWU strike (1949), the Volcker Fed (monetary aggregate targeting (1981)), and the Great Recession (2009). All other step-wise breaks are endogenous, with final specification selected to minimize the Akaike Information Criterion. A regulatory break dummy variable is set to the value 1 from 1975 onward, and is set to the value 0.00001 from 1926-1974 (estimating equation is specified in natural logarithms). Shaded blue area is two standard-error bandwidth around model's estimate.



Housing and land regulation

Econ 311: The Economy of Hawaii
UH Manoa, April 2017

Paul H. Brewbaker, Ph.D., CBE

Consider the image on the title slide

- Traditional Hawaiian culture: land use organized around ahupua‘a concept
  - Hydrology the determinant—flowing water guides spatial location of activities
  - Each ahupua‘a a catchment area, bounded by ridgelines, extending seaward
  - Distribution of economic activity governed by endowment (arable land, ocean resources) under common resource system—common property
  - Management of activity under command structure (konohiki as administrator): benevolent dictatorship, and sometimes maybe not so benevolent
- Now look at Manoa valley again under Western system
  - Market-oriented system under private property arrangements
  - Distribution of economic activity governed by endowment, boundaries: market transactions (including contractual arrangements government trade)
  - Concentration of high-density urban activities along shoreline, facilitated by transportation infrastructure (scale economies, agglomeration externalities)
  - Medium density activity—including knowledge capital formation at UH—in mid-zone, integrated with transportation network
  - Low density residential activity at distance (congestion externalities)

Land and housing in Hawaii fall under the same policy framework: housing, urbanization, *are* principle resource management challenge

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Honolulu CPI expenditure shares 2004-05 (%)

Average annual expenditures	100.00
Food	14.72
Food at home	7.70
Cereals and bakery products	1.01
Meats, poultry, fish, and eggs	1.98
Dairy products	0.61
Fruits and vegetables	1.51
Other food at home	2.58
Food away from home	7.02
Alcoholic beverages	0.84
Housing	31.67
Shelter	19.82
Owned dwellings	11.86
Rented dwellings	7.21
Other lodging	0.75
Utilities, fuels, and public services	5.12
Household operations	1.26
Housekeeping supplies	1.49
Household furnishings and equipment	3.99
Apparel and services	3.93
Transportation	18.06
Vehicle purchases (net outlay)	8.68
Gasoline and motor oil	3.02
Other vehicle expenses	4.42
Public transportation	1.95
Healthcare	4.73
Entertainment	5.69
Personal care products and services	1.41
Reading	0.23
Education	2.40
Tobacco products and smoking supplies	0.44
Miscellaneous	1.57
Cash contributions	2.02
Personal insurance and pensions	12.28
Life and other personal insurance	0.95
Pensions and Social Security	11.33

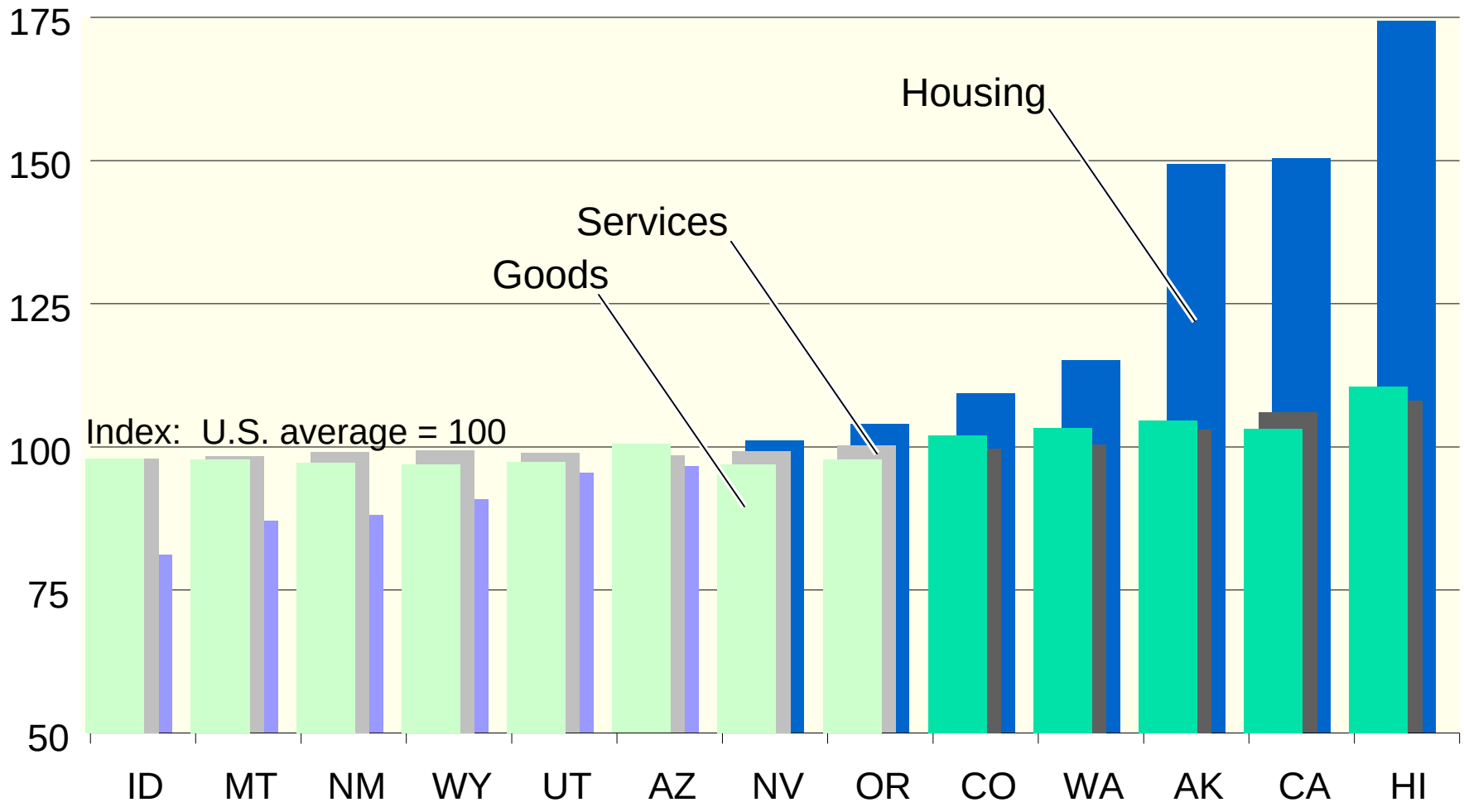
Source: BLS (http://www.bls.gov/cex/2005/msas/west.xls); expenditure share calculations by TZE.

Comparing recent DBEDT consumer survey data for Honolulu to 2004-05 C.E.S. data (weights for Honolulu CPI-U)

percent of total expenditures	2004-5	2013-14
Food	14.7	14.7
Alcoholic beverages	0.8	1.1
Housing	31.7	43.2
Apparel and services	3.9	1.9
Transportation	18.1	13.9
Health care	4.7	5.8
Entertainment	5.7	2.5
Personal care products and services	1.4	1.0
Reading	0.2	0.2
Education	2.4	4.0
Tobacco prod. & smoking supplies	0.4	0.2
Miscellaneous	1.6	1.6
Cash contributions	2.0	1.7
Personal insurance and retirement savings	12.3	8.2
Average annual expenditures	100.0	100.0

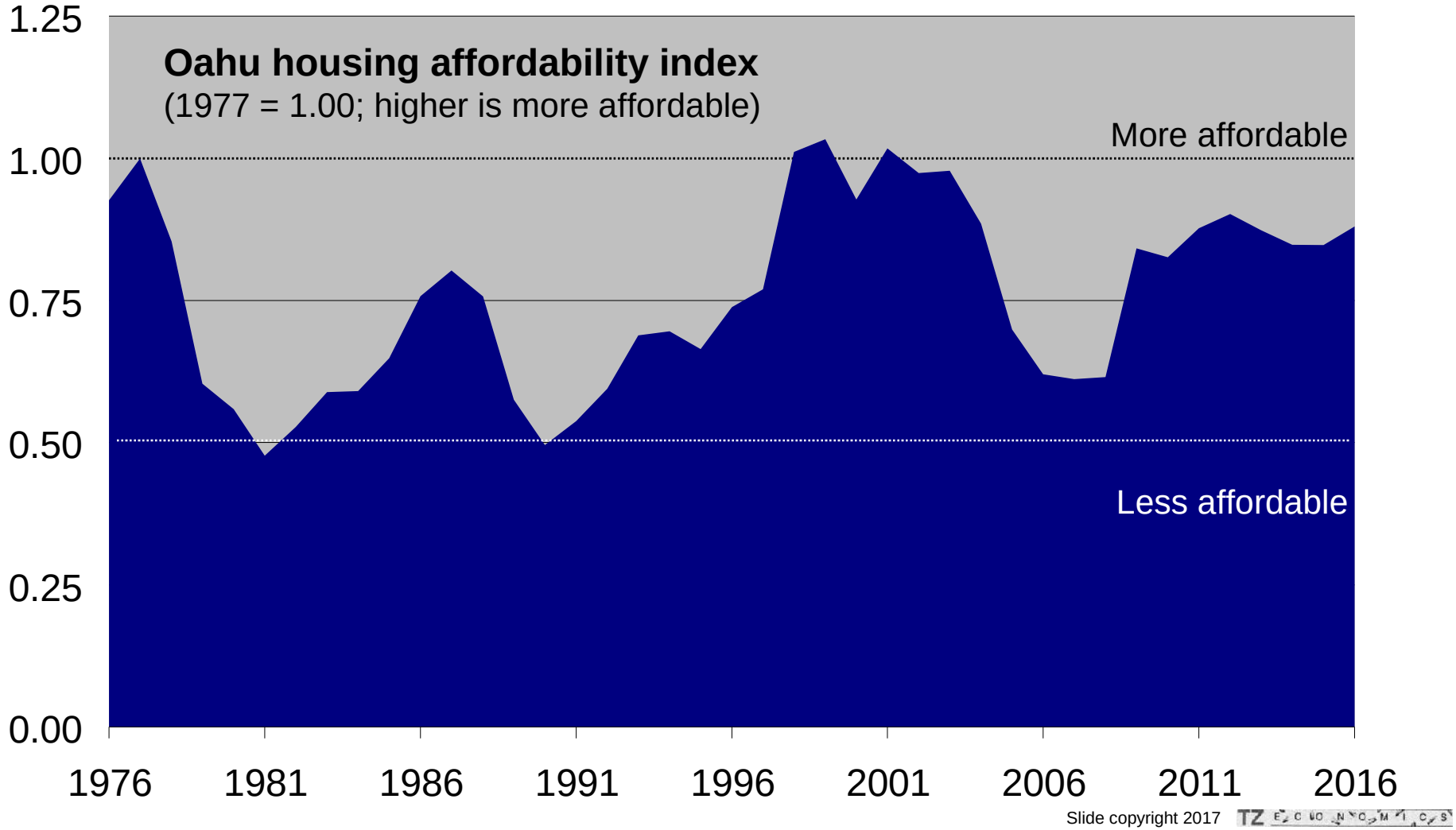
Source: Hawaii DBEDT, Honolulu Consumer Spending 2013-14 (April 2016)(http://files.hawaii.gov/dbedt/economic/reports/CE_Oahu_Survey_Final.pdf)

Western Metropolitan RPP indexes: Honolulu (Oahu) housing contribution to living cost differential is 75% higher than average



Source: Bureau of Economic Analysis (http://bea.gov/iTable/iTableHTML.cfm?reqid=70&step=1&isuri=1&acrdn=8)

Political concern over affordability: more fake news devoid of empirical content? Evolution of Oahu housing affordability for 40 years



Sources: Federal Reserve Board, Federal Reserve Bank of St. Louis (mortgage interest rates); Prudential Locations, Bank of Hawaii, Honolulu Board of Realtors (median single-family home prices); U.S. Department of Housing and Urban Development (four-person median family incomes)

Cost of living: tell me something new

- The cost of living premium for Honolulu over U.S. metropolitan areas has ranged narrowly 20-25 percent for 70 years by various measures (ranging widely 15-30 percent), less perhaps for the Neighbor Islands but mostly because East Hawaii Island housing is relatively affordable
- Perfect capital and labor mobility within the U.S. (part of the definition of economic union that Makes America Great Already and makes Brexit—as is said in the U.K.—Way Out) means that the living cost differentials are an equilibration mechanism holding at bay net in-migration
- It seems unlikely that solving the "affordable housing" problem in Hawaii, which has little to do with homelessness, *per se**, will have a material impact on living cost differentials. It is still worth solving.

*Homelessness is primarily a consequence of the de-institutionalization of mental health treatment, the pattern of substance abuse, veterans' issues (which are not mutually-exclusive with respect to the first two), and economic misfortune characterized by a high degree of economic mobility (today's bad luck individual is not the same as tomorrow's), combined with absence of a credible threat of enforcement of protections for private or public property against squatting.

Just to be clear what is the public policy issue

- Populist political approach risks conflating common and proper nouns
  1. I mean “affordable (the adjective) housing (the common noun)”
  2. Regulators usually mean “Affordable Housing,” a proper noun

- From Mayor Caldwell’s State of the City Address, February 16, 2017*:

  To solve homelessness, the answer is what? More affordable housing. Ask any provider: it’s providing housing for those who don’t have it. And that’s what we’re going to talk about for the rest of tonight. During the next four years this administration is going to focus, laser-like, on getting more affordable housing built [emphasis added]*. If we don’t change the course that we’ve been on for a long period of time, this island becomes a* de facto *gated community only for the exclusive few. And we have huge challenges*.

- Policy dilemma: conflating an *income problem* (not enough it) for a *housing problem* (not enough of *it*)—solution to the second defined in terms of the first is a mistake, but that is what jurisdictions do by imposing “inclusionary zoning” requirements that define a housing production quota in terms of quantiles of the *income* distribution (rather than home price distribution)

*See https://www.honolulu.gov/housing.html

Land area and land use

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Distinguishing Hawaii housing market

- Basic geographic characteristics distinguish Hawaii:
  1. Geographic isolation (some impediment to mobility, but not capital mobility)
  2. Non-contiguous markets—cannot drive from one island to another
  3. Developable areas bounded by (high) mountains and (deep) ocean
  4. Further resource constraints: preservation of upland watershed, lowland wetlands, environmentally-sensitive and dynamic shorelines
- Basic regulatory characteristics distinguish Hawaii:
  1. Only state with single, statewide Land Use Law
  2. All land use district amendments require Land Use Commission approval
  3. Each County has its own land use, zoning regulatory requirements, codes
  4. Jurisdictions are notoriously *inefficient* in handling approvals, changes
- Historical legacies in Hawaii
  1. Private property introduced under Great Mahele (1848)
  2. Concentration of landownership under Plantation Era oligarchies
  3. Populist political use of "police powers of state" as countervailing force*
  4. "California-style" politics of NIMBY (Not In My Back Yard)
  5. Cultural preservation takes on unique characteristics (*e.g*. Hawaiian burials)

*Note: Under the U.S. Constitution's 4th amendment, "takings" must be accompanied by just compensation, are available to jurisdictions only for a "valid public purpose," and must be shown to satisfy "rational nexus" when involving exactions

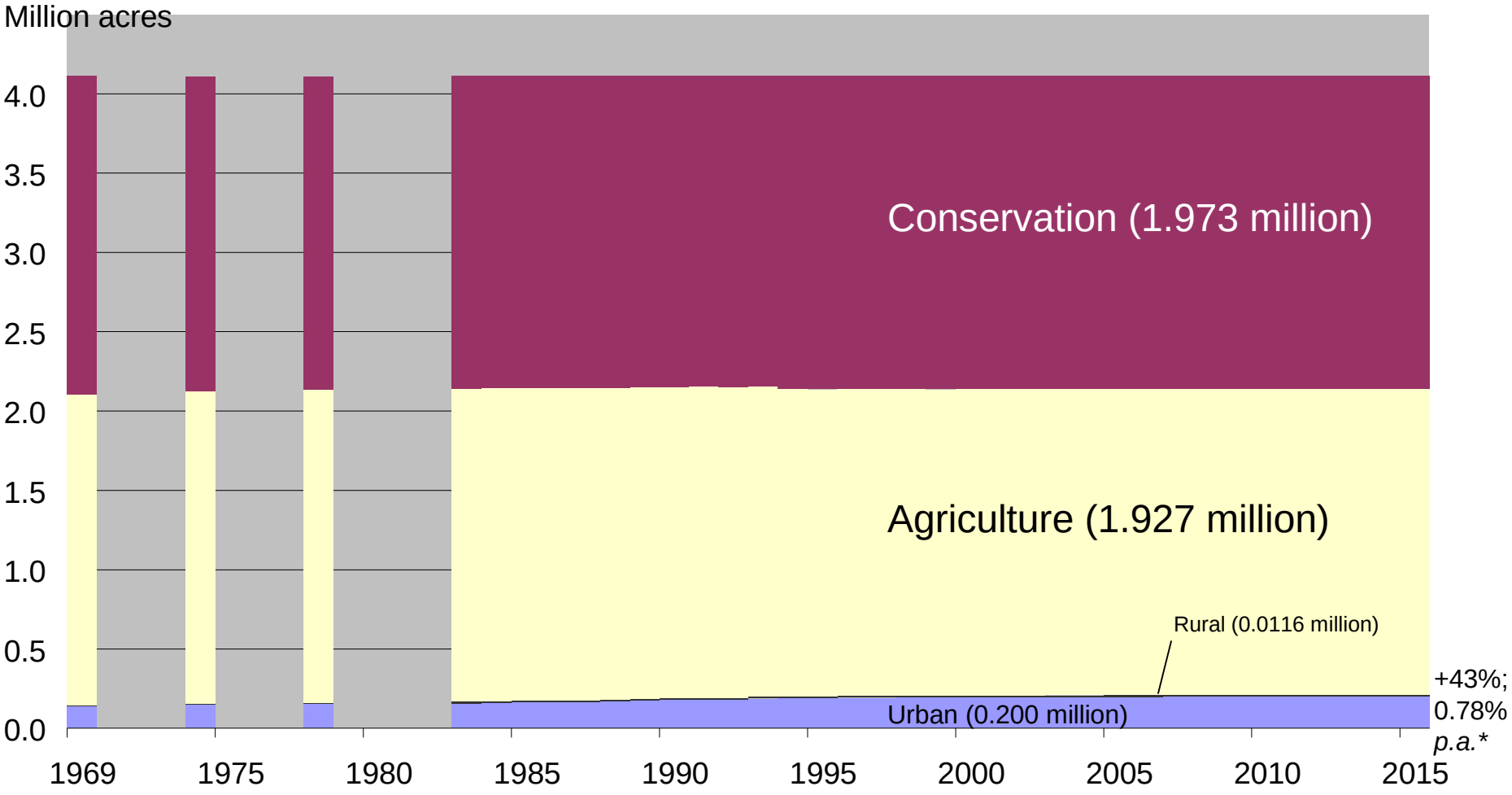
Estimated acreage of State Land Use Districts by island, end-December 2006

[As of December 31. Total acreage, including inland water, as classified by the Hawaii State Land Use Commission under the provisions of Chapter 205, Hawaii Revised Statutes, as amended. All data are approximate]

Island	Total area 1/	Classification by State Land Use Commission 2/			
		Urban	Conservation	Agricultural	Rural
State total - 2015	4,112,388	200,439	1,973,846	1,926,502	11,602
Hawaii	2,573,400	54,145	1,304,347	1,212,886	2,023
Maui	465,800	24,191	194,836	242,720	4,053
Kahoolawe	28,800	-	28,800	-	-
Lanai	90,500	3,330	38,197	46,566	2,407
Molokai	165,800	2,539	49,768	111,627	1,866
Oahu	386,188	101,661	156,829	127,698	-
Kauai	353,900	14,573	198,769	139,305	1,253
Niihau	45,700	-	-	45,700	-
Kaula and Lehua	400	-	400	-	-
Other islands	1,900	-	1,900	-	-

Source: Hawaii DBEDT State of Hawaii Data Book Section 6 (http://hawaii.gov/dbedt/info/economic/databook/2010-individual/06/)

No, this is not a graph by Mark Rothko: this is how Hawaii land use districts have changed since the Land Use Law was adopted



*Resident population growth rate 1970-2015 was 1.39% *per annum*

Sources: U.S. Bureau of the Census, Hawaii Department of Business Economic Development, and Tourism (http://files.hawaii.gov/dbedt/economic/databook/db2015/section01.xls and http://files.hawaii.gov/dbedt/economic/databook/db2015/section06.xls)

Estimated acreage share of statewide Land Use Districts by island, end-December 2015

[As of December 31. Total acreage, including inland water, as classified by the Hawaii State Land Use Commission under the provisions of Chapter 205, Hawaii Revised Statutes, as amended. All data are approximate]

Island	Total area 1/	Classification by State Land Use Commission 2/			
		Urban	Conservation	Agricultural	Rural
State total - 2015	100.0	4.9	48.0	46.8	0.2821
Hawaii	62.6	1.3	31.7	29.5	0.0492
Maui	11.3	0.6	4.7	5.9	0.0986
Kahoolawe	0.7		0.7		
Lanai	2.2	0.1	0.9	1.1	0.0585
Molokai	4.0	0.1	1.2	2.7	0.0454
Oahu	9.4	2.5	3.8	3.1	
Kauai 4/	8.6	0.4	4.8	3.4	0.0305
Niihau 4/	1.1				

Source: Hawaii DBEDT State of Hawaii Data Book Section 6 (http://files.hawaii.gov/dbedt/economic/databook/db2015/section06.xls)

Estimated acreage share of each island's Land Use Districts, end-December 2015

[As of December 31. Total acreage, including inland water, as classified by the Hawaii State Land Use Commission under the provisions of Chapter 205, Hawaii Revised Statutes, as amended. All data are approximate]

Island	Total area 1/	Classification by State Land Use Commission 2/			
		Urban	Conservation	Agricultural	Rural
State total - 2015	100	4.9	48.0	46.8	0.282
Hawaii	100	2.1	50.7	47.1	0.079
Maui	100	5.2	41.8	52.1	0.870
Kahoolawe	100		100.0		
Lanai	100	3.7	42.2	51.5	2.660
Molokai	100	1.5	30.0	67.3	1.125
Oahu	100	26.3	40.6	33.1	
Kauai	100	4.1	56.2	39.4	0.354
Niihau	100			100.0	

Source: Hawaii DBEDT State of Hawaii Data Book Section 6 (http://files.hawaii.gov/dbedt/economic/databook/db2015/section06.xls)

Land use characteristics of Oahu: City & County of Honolulu definitions—12% of island and 28% of Town comprise urbanized acreages

Subject	June 1994 Oahu total	June 1998 Oahu total	June 1998 Honolulu district	June 1998 Rest of Oahu
Land use in acres	375,146	374,870	54,125	320,745
Residential	31,110	32,110	9,913	22,197
Industrial	8,658	9,571	3,790	5,781
Commercial	4,177	4,277	1,543	2,734
Hotel	319	315	128	187
Agriculture	70,400	56,954	300	56,654
Usable vacant	38,632	48,084	2,449	45,635
Other	221,851	223,559	36,002	187,557
Land use shares (%)	100.0	100.0	100.0	100.0
Residential	8.3	8.6	18.3	6.9
Industrial	2.3	2.6	7.0	1.8
Commercial	1.1	1.1	2.9	0.9
Hotel	0.1	0.1	0.2	0.1
Agriculture	18.8	15.2	0.6	17.7
Usable vacant	10.3	12.8	4.5	14.2
Other	59.1	59.6	66.5	58.5

Source: Hawaii DBEDT State of Hawaii Data Book Section 6 (http://files.hawaii.gov/dbedt/economic/databook/db2015/section06.xls)

Major landowners by island, by type, 2009

[In acres. As of November 2009 for Kauai County, June 2011 for Maui County and July 2011 for Hawaii and Honolulu counties]

Rank	Landowner	Total acres	Hawaii	Kahoolawe	Kauai	Lanai	Maui	Molokai	Niihau	Oahu
1	Gov't. - State (including DHHL)	1,534,792	1,088,399	28,537	155,674	541	127,897	48,961	127	84,656
	Gov't. - State (excluding DHHL)	1,341,086	974,452	28,537	136,159	513	97,000	24,196	127	80,103
	Gov't. - State Dept. of Hawaiian Home Lands (DHHL)	193,706	113,947	-	19,515	28	30,897	24,765	-	4,553
2	Government - Federal	530,792	432,205	24	3,437	8	33,659	136	272	61,051
3	Kamehameha Schools	363,476	297,109	-	10,876	-	2,636	4,937	-	47,918
4	Castle & Cooke	118,858	233	-	-	89,188	-	-	-	29,438
5	Alexander & Baldwin Inc.	113,135	10	-	20,240	-	92,865	-	-	21
6	Parker Ranch	106,883	106,883	-	-	-	-	-	-	-
7	Molokai Ranch	58,418	-	-	-	-	-	58,418	-	-
8	Robinson Family	50,671	-	-	50,671	-	-	-	-	-
9	Robinson Aylmer	46,044	-	-	-	-	-	-	46,044	-
10	Grove Farm	36,139	-	-	36,139	-	-	-	-	-
11	Government - County 1/	32,999	6,044	-	707	229	7,456	258	-	18,306
12	Haleakala Ranch Co.	29,160	-	-	-	-	29,160	-	-	-
13	Maui Land & Pineapple Co. Inc.	22,800	-	-	-	-	22,800	-	-	-
14	Yee Hop	21,637	21,637	-	-	-	-	-	-	-
15	Ulupalakua Ranch	18,476	-	-	-	-	18,476	-	-	-
16	W.H. Shipman	16,808	16,808	-	-	-	-	-	-	-
17	Kahuku Aina Properties	16,423	16,423	-	-	-	-	-	-	-
18	McCandless Ranch	15,729	14,994	-	-	-	-	-	-	-
19	Finance Factors Ltd	13,232	13,231	-	-	-	1	-	-	-
20	Puu O Hoku Ranch	13,098	-	-	-	-	-	13,098	-	-

Source: Hawaii DBEDT *State of Hawaii Data Book* (http://hawaii.gov/dbedt/info/economic/databook/2010-individual/06/060710.xls) Office of State Planning, GIS Program, Large Landowners Data - 2011, records

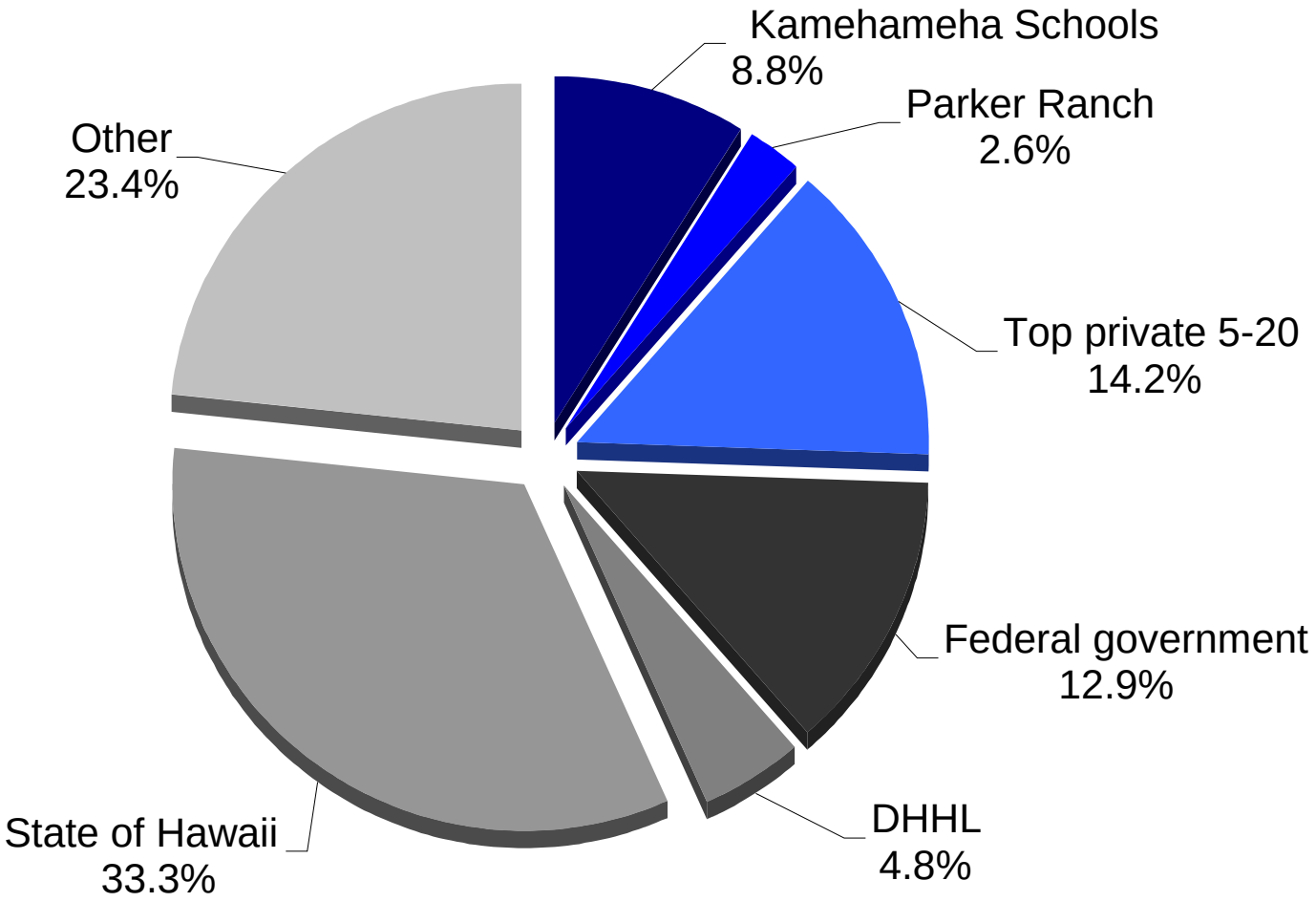
Major landowners by island, by type, 2013

[In acres. As of January 2012 for Kauai County, June 2013 for Hawaii County and July 2013 for Maui and Honolulu counties]

Rank	Landowner	Total acres	Hawaii	Kahoolawe	Kauai	Lanai	Maui	Molokai	Niihau	Oahu
1	Gov't State including DHHL	1,565,538.0	1,091,826.4	28,536.8	155,517.6	541.1	153,985.2	49,098.4	127.1	85,905.5
	Gov't. - State (excluding DHHL)	1,367,607.5	974,565.2	28,536.8	136,025.9	512.7	122,647.7	23,978.9	127.1	81,213.1
	Gov't. - State Dept. of Hawaiian Home Lands (DHHL)	197,930.6	117,261.1	-	19,491.7	28.4	31,337.4	25,119.5	-	4,692.3
2	Govt. Federal	530,122.9	432,471.2	23.7	3,437.3	8.3	33,658.2	172.0	271.7	60,080.6
3	Kamehameha Schools	363,526.5	297,094.7	-	10,872.9	-	2,636.5	4,936.7	-	47,985.7
4	Parker Ranch	106,737.1	106,737.1	-	-	-	-	-	-	-
5	Lanai Resorts LLC	89,184.1	-	-	-	-	-	-	-	-
6	Alexander & Baldwin	88,763.3	13.6	-	21,016.1	-	67,711.2	-	-	22.4
7	Molokai Ranch	56,743.6	-	-	-	-	-	56,743.6	-	-
8	Robinson Family	50,614.3	-	-	50,614.3	-	-	-	-	-
9	Robinson Aylmer	46,040.6	-	-	-	-	-	-	46,040.6	-
10	Government - County 1/	34,142.1	6,633.3	-	873.0	229.2	7,677.8	257.9	-	18,470.8
11	Grove Farm	33,294.0	-	-	33,294.0	-	-	-	-	-
12	Castle & Cooke	30,141.9	233.0	-	-	-	-	-	-	29,908.9
13	Haleakala Ranch	29,199.9	-	-	-	-	29,199.9	-	-	-
14	Maui Land & Pine	23,042.1	-	-	-	-	23,042.1	-	-	-
15	Yee Hop	21,636.6	21,636.6	-	-	-	-	-	-	-
16	Ulupalakua Ranch	18,523.6	-	-	-	-	18,523.6	-	-	-
17	W.H. Shipman	16,804.8	16,804.8	-	-	-	-	-	-	-
18	Kahuku Aina Properties	16,423.3	16,423.3	-	-	-	-	-	-	-
19	McCandless Ranch	15,163.5	15,004.7	-	-	-	-	-	-	158.8
20	Finance Factors	13,240.3	13,232.4	-	-	-	7.6	0.3	-	-

Source: Hawaii DBEDT *State of Hawaii Data Book* (http://files.hawaii.gov/dbedt/economic/databook/2015-individual/06/060715.xls), Office of State Planning, GIS Program, Large Landowners Data - 2013, records

Distribution of landownership in Hawaii: top 20 owners and all others (Other 23.4%)



Source: Hawaii DBEDT *State of Hawaii Data Book* (http://files.hawaii.gov/dbedt/economic/databook/2015-individual/06/060715.xls), Office of State Planning, GIS Program, Large Landowners Data - 2013, records

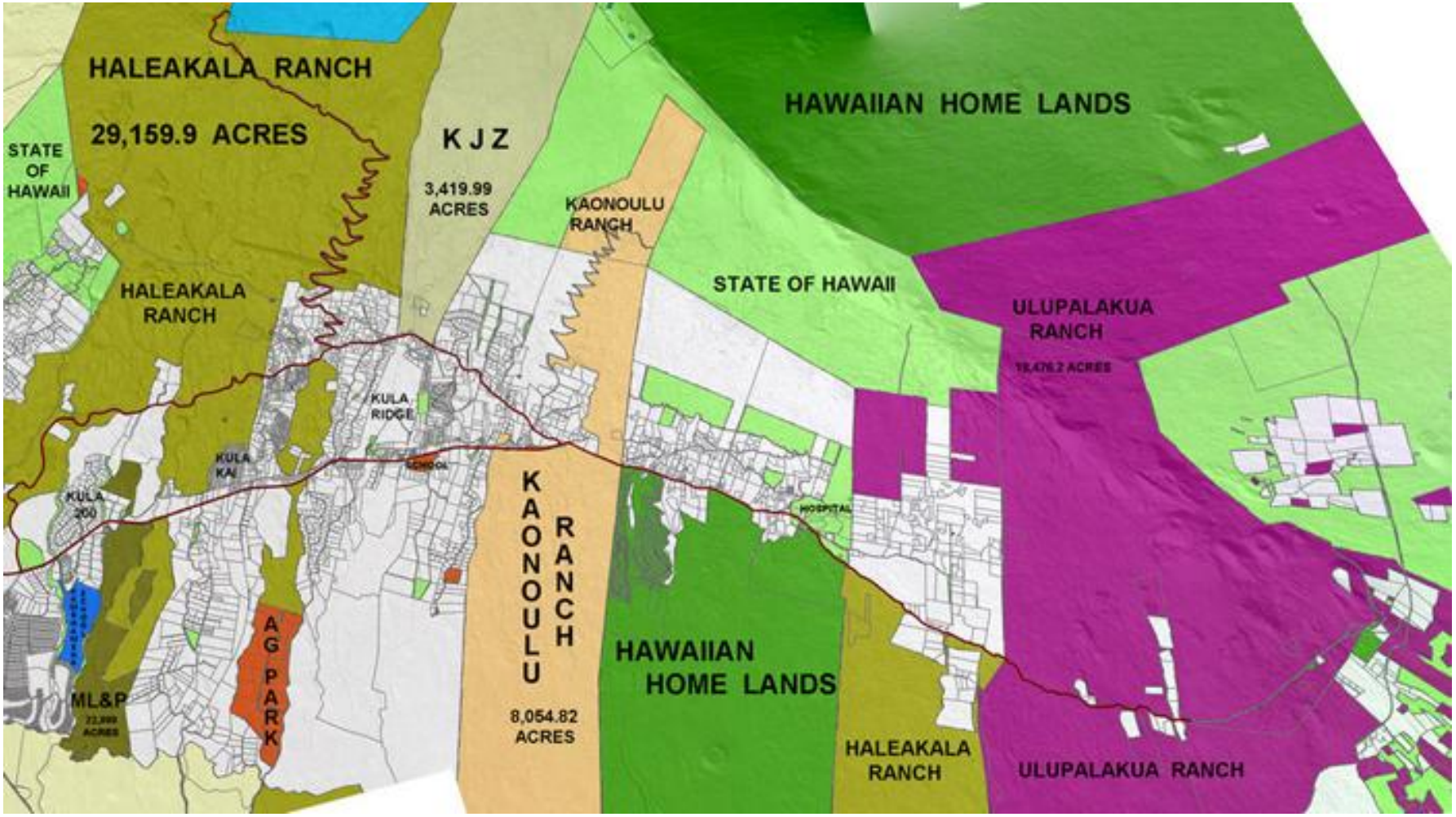
Changes in land holdings (acres) among the top 20 landowners, 2009-11 – 2013

1	Gov't State including DHHL	30,746.0
	Gov't. - State (excluding DHHL)	26,521.0
	Gov't. - State DHHL	4,225.0
2	Govt. Federal	(668.8)
3	Kamehameha Schools	50.1
4	Parker Ranch	(145.9)
5	Lanai Resorts LLC	89,184.1
6	Alexander & Baldwin	(24,371.4)
7	Molokai Ranch	(1,674.0)
8	Robinson Family	(56.3)
9	Robinson Aylmer	(3.5)
10	Government - County	1,142.6
11	Grove Farm	(2,844.5)
12	Castle & Cooke	(88,716.6)
13	Haleakala Ranch	40.0
14	Maui Land & Pine	242.1
15	Yee Hop	(0.4)
16	Ulupalakua Ranch	47.4
17	W.H. Shipman	(3.4)
18	Kahuku Aina Properties	0.1
19	McCandless Ranch	(565.6)
20	Finance Factors	8.3

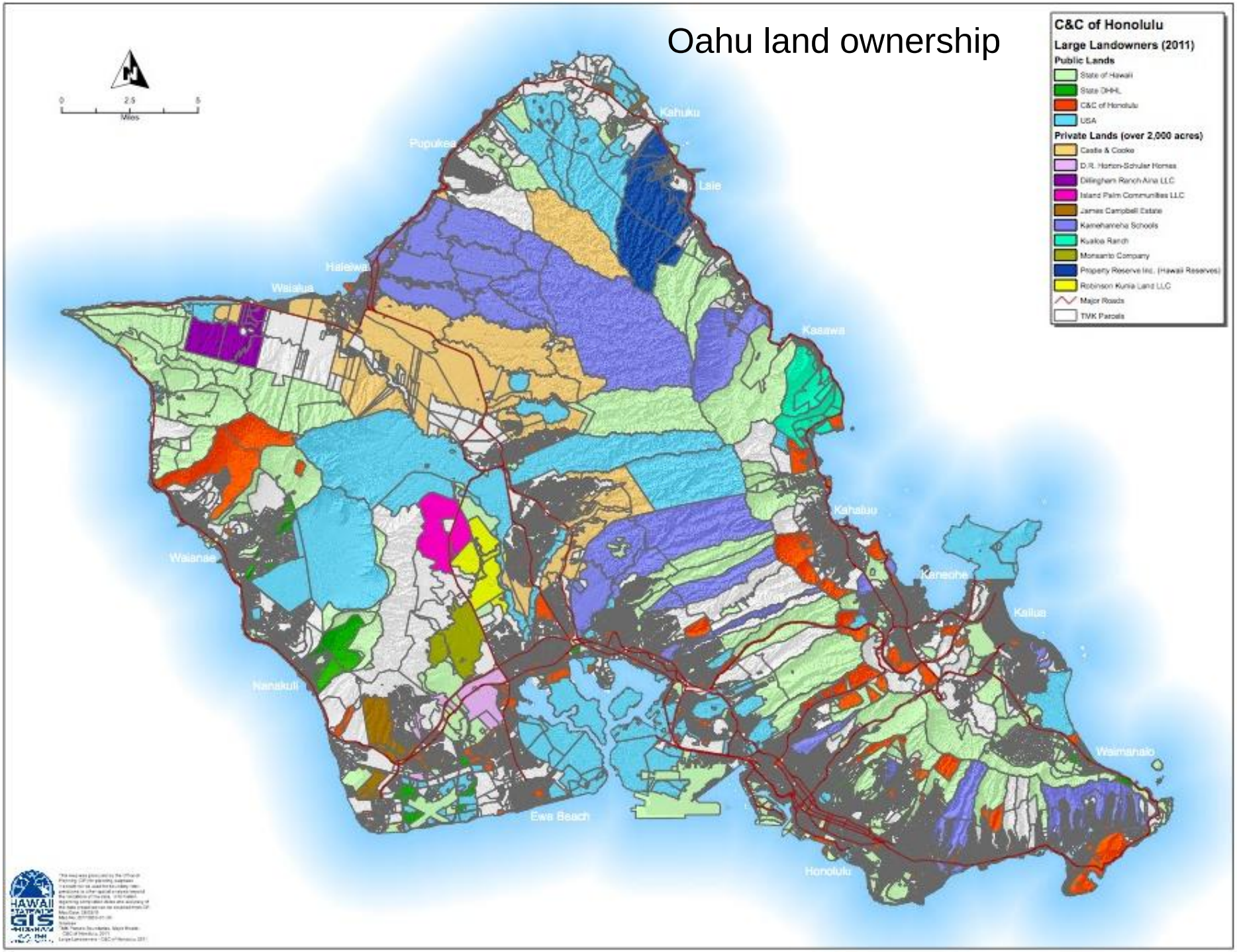
Numbers in parentheses denote decreases

Source: Hawaii DBEDT *State of Hawaii Data Book* (http://files.hawaii.gov/dbedt/economic/databook/2015-individual/06/060715.xls), Office of State Planning, GIS Program, Large Landowners Data - 2013, records

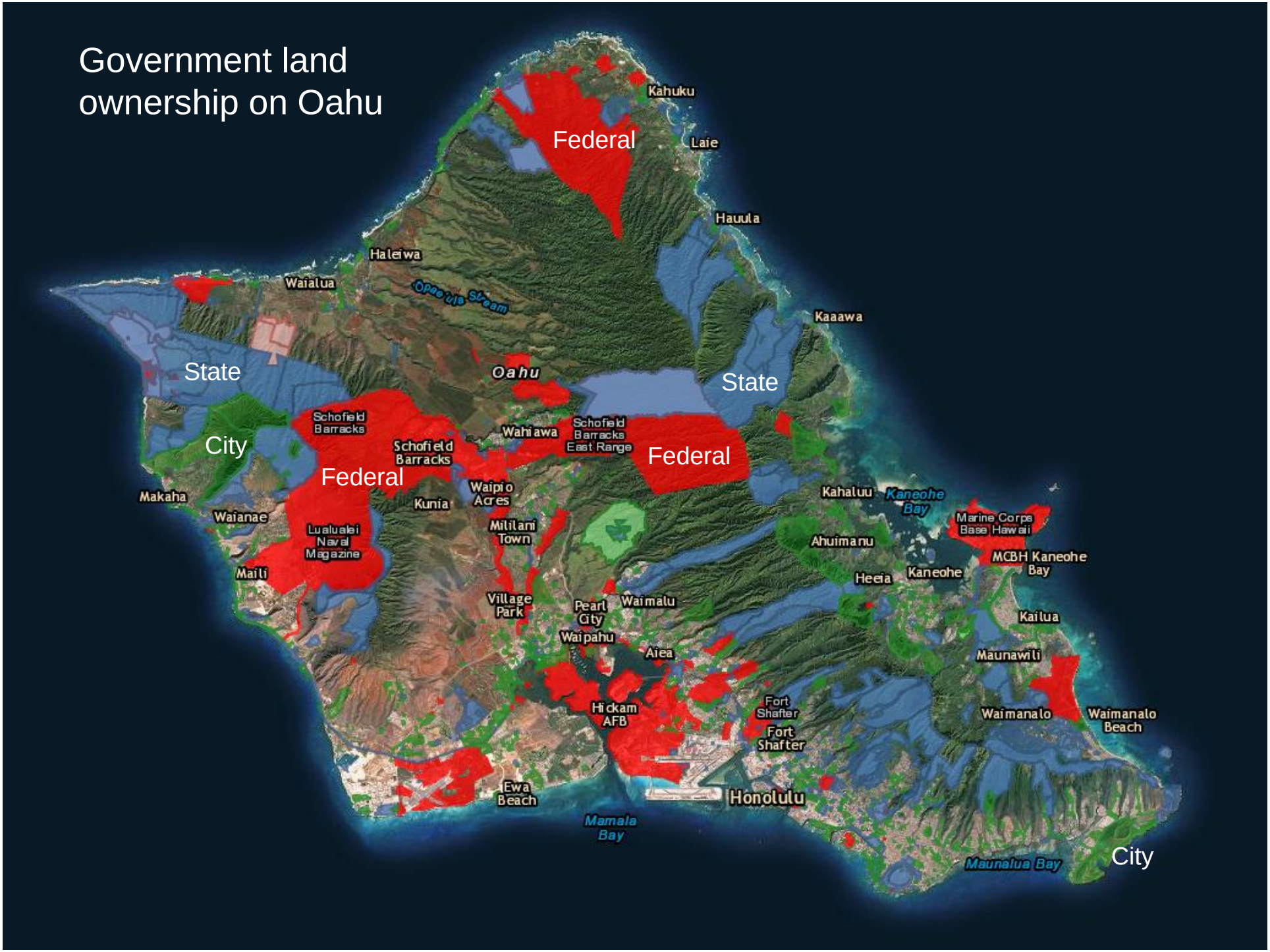
Land ownership in Upcountry Maui

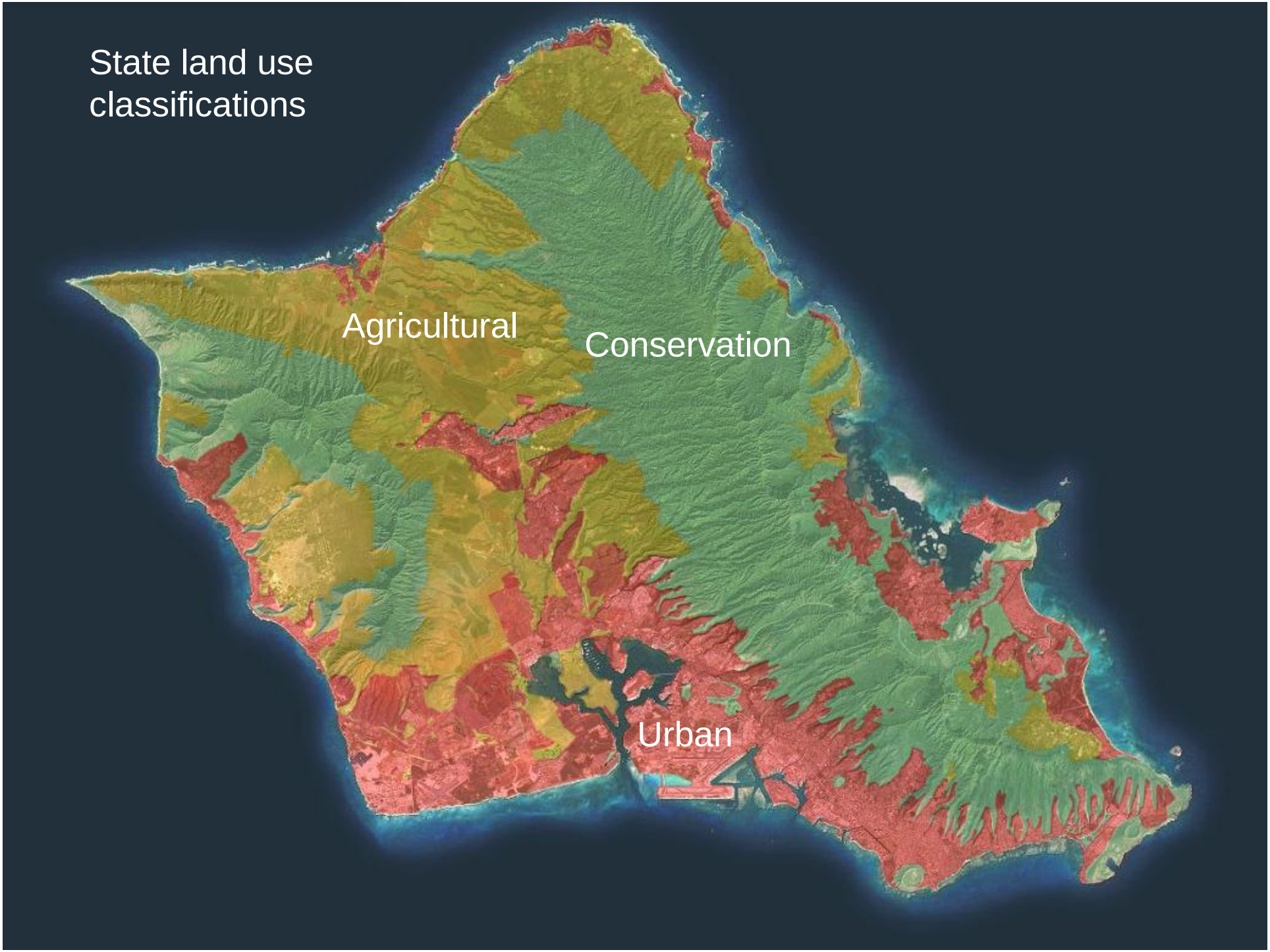


Oahu land ownership



Government land ownership on Oahu




State land use classifications
Agricultural
Conservation
Urban

Stock/flow relationships

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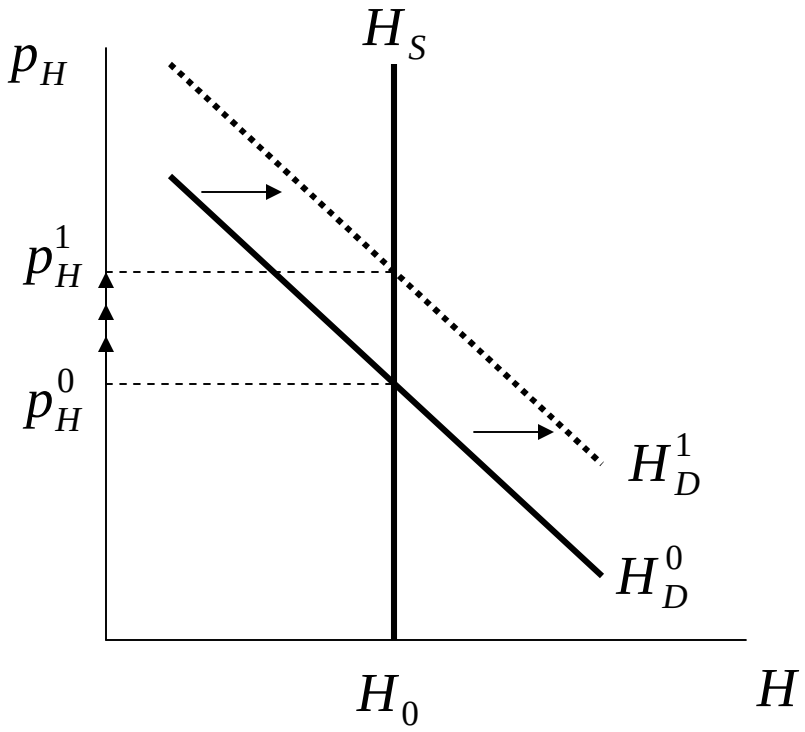
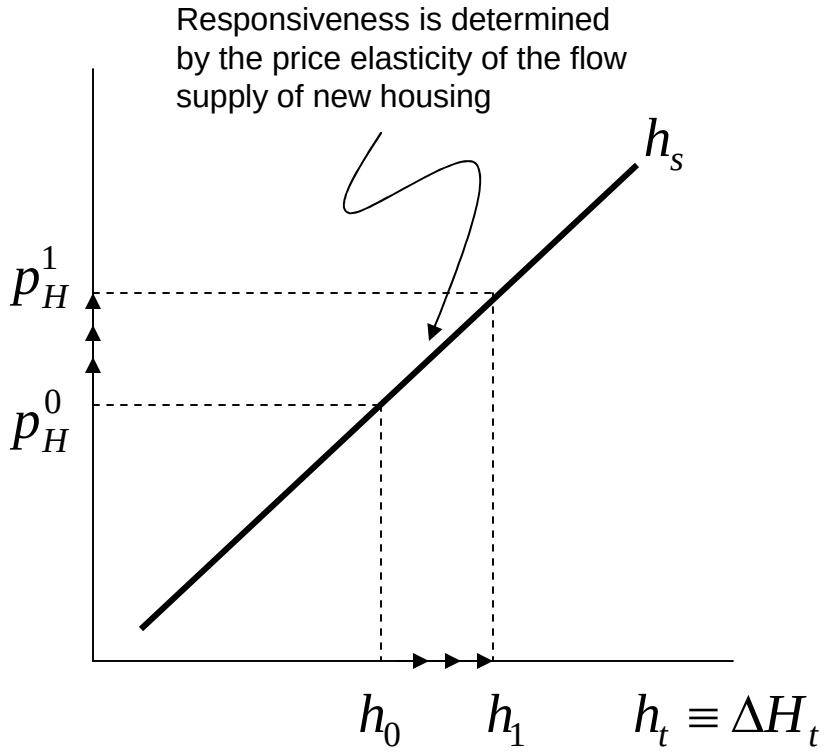
Stock-flow interaction: an increase in the stock demand for housing raises the flow supply

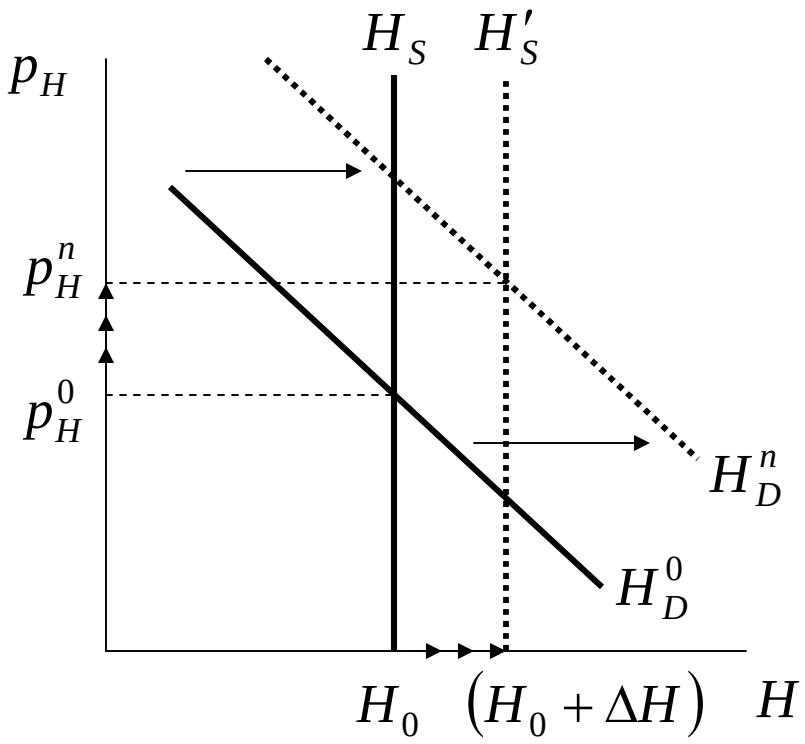


Housing stock

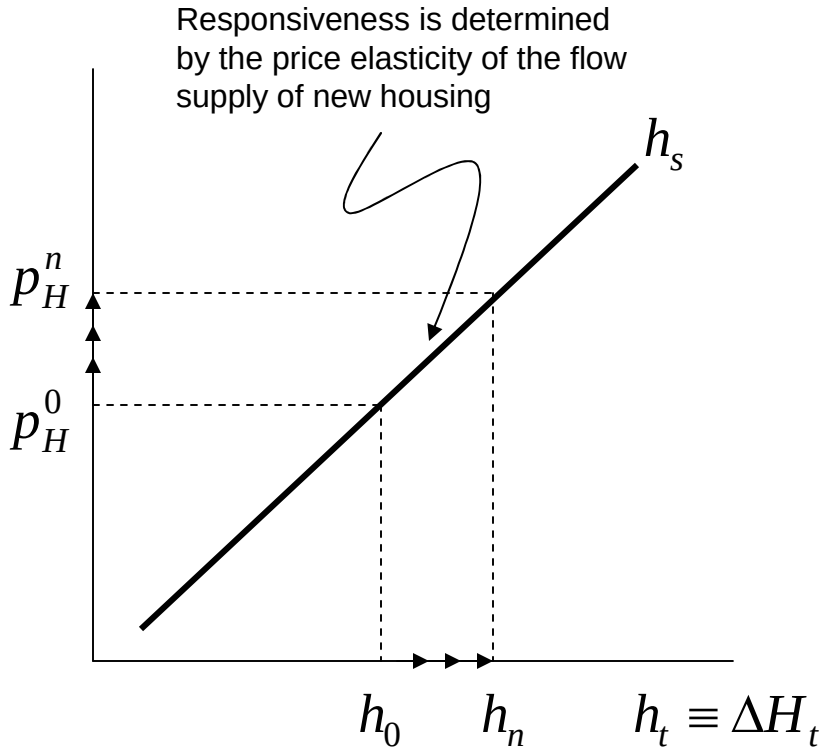


Flow supply of new housing

Over time (*n* periods), the *extent* of price increases is determined by the interaction of stocks and flows

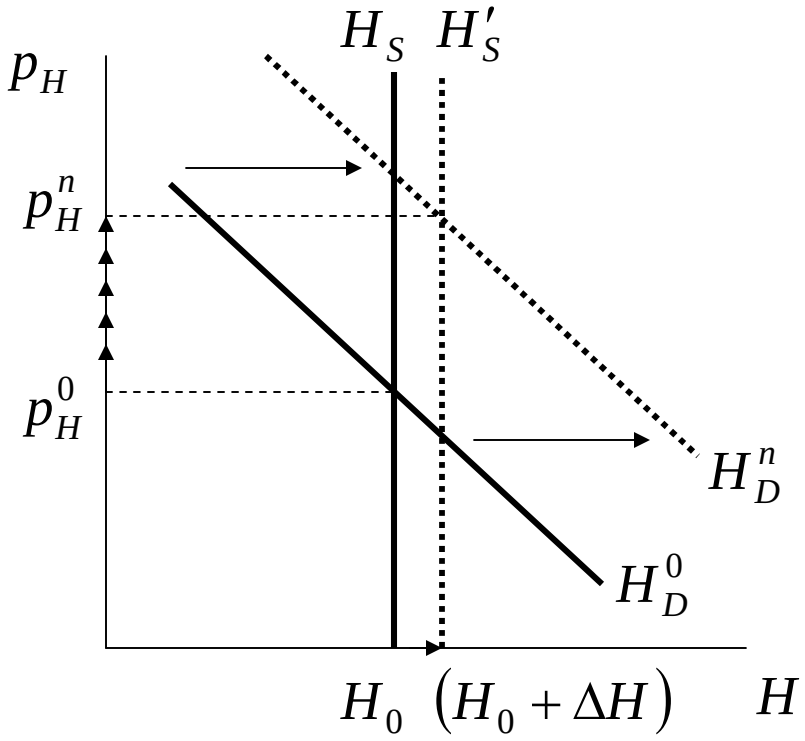


Housing stock

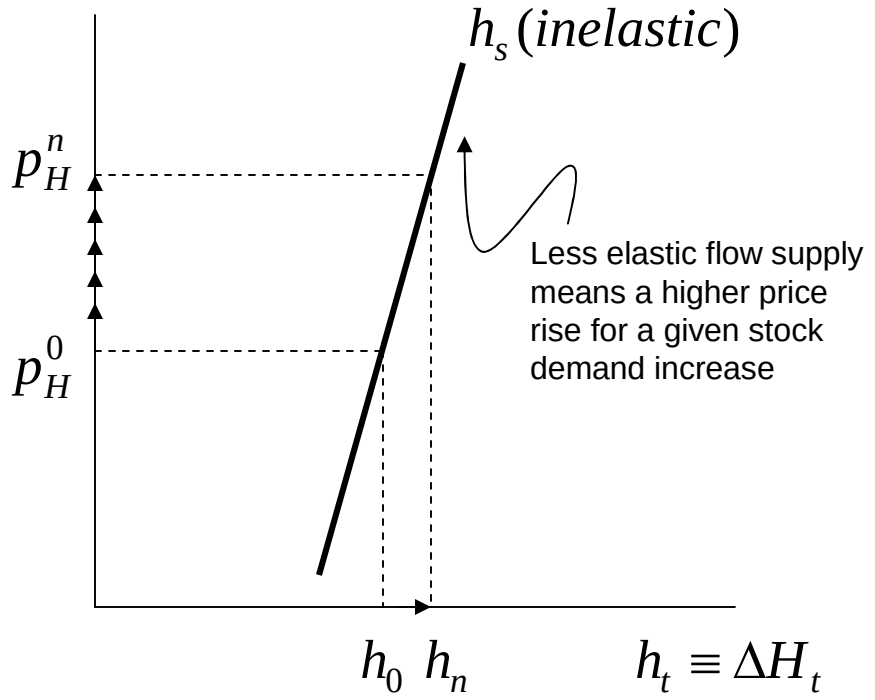


Flow supply of new housing

Lower flow supply elasticity with respect to prices implies less new housing, larger price increases: restrictions *reduce* elasticity of flow supply



Housing stock



Flow supply of new housing

Supply constraints (regulatory; natural)

"Steep slopes and water bodies" complement gate-keeping regulatory postures towards urbanization to generate more volatile home prices

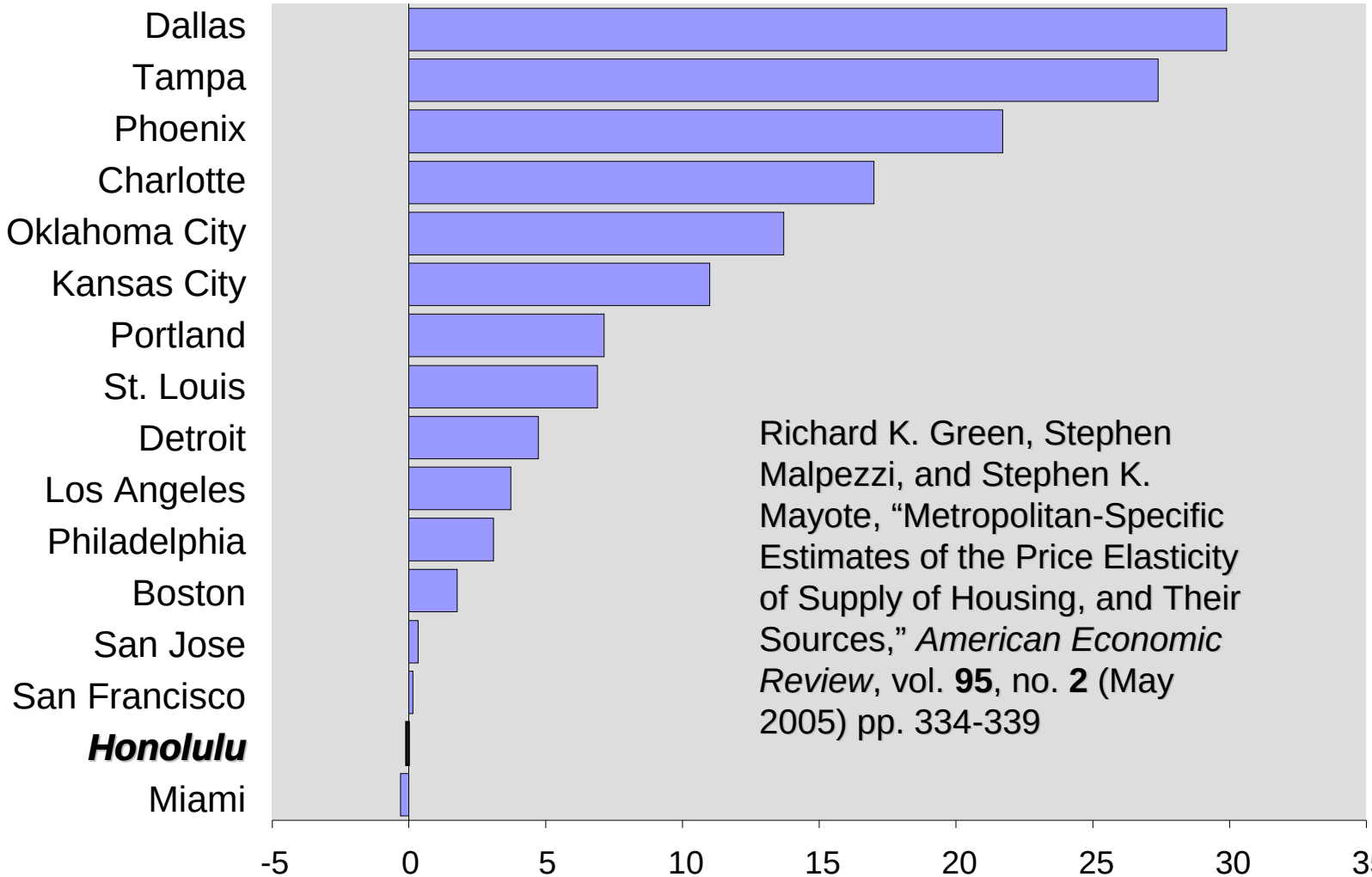
Basic findings in the land economics literature

- Geographic and regulatory constraints associated with one of more of following:*
  1. Higher prices
  2. Higher volatility
- Jurisdictions have increasingly relied on exactions to require developers to make social contributions as condition of development entitlement (see your readings—or any recent writings—by U.H. Law Professor David Callies)

  Examples: "affordable" housing requirements (quotas), public schools, *etc*.
- Example from Jim Mak's book: one resort project (Ewa) was required by the LUC to create "one non-tourism job for each tourism job" (whatever *that* is)
- Regulatory process in Hawaii is a "gatekeeping" process intended to maximize the opportunity for opponents to obstruct development
- Unclear if *bona fide* natural resource stewardship objectives are achieved

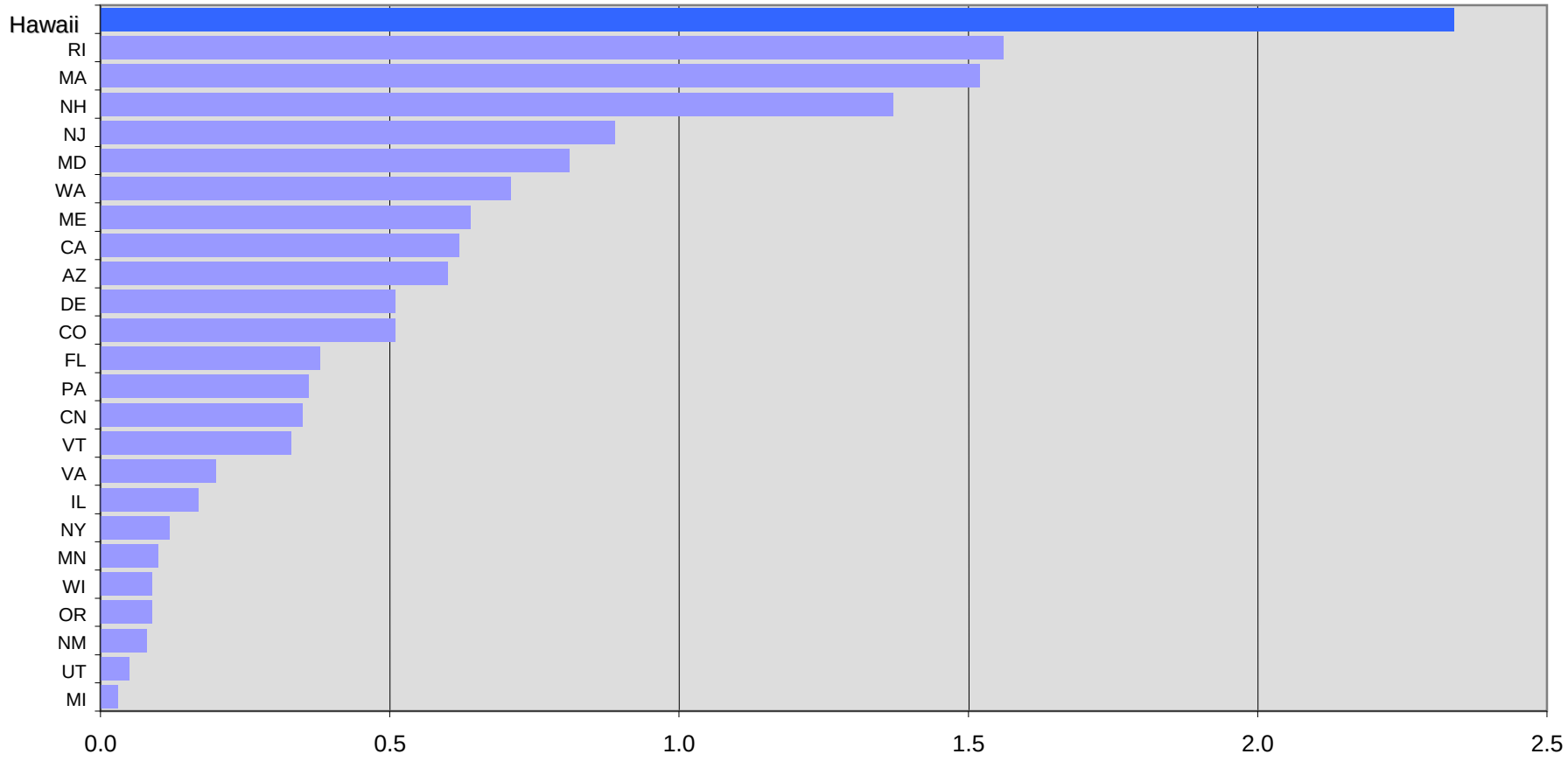
*See Andrew D. Paciorek, "Supply Constraints and Housing Market Dynamics," *Finance and Economics Discussion Series* **2012-01** (December 1, 2011) (http://www.federalreserve.gov/pubs/feds/2012/201201/201201pap.pdf) and anything written by Edward Glaeser and Joseph Gyourko, for example, Edward L. Glaeser, Joseph Gyourko, *Rethinking Federal Housing Policy* (2008) American Enterprise Institute (http://www.aei.org/book/economics/rethinking-federal-housing-policy/)

Empirical estimates of housing supply "elasticity:" among urban markets, Hawaii's near bottom of list



Source: *American Economic Review* Papers and Proceedings of the 117th Annual Meeting of the American Economic Association, Philadelphia, PA, January 7-9, 2005 (May 2005) "Regulation and the High Cost of Housing."

Top 25 states, Wharton Residential Land Use Regulatory Index (0 = national average); higher is more restrictive



Index values are from the Wharton Residential Land Use Regulation Project. An index value of 0 implies the average level of regulation in the country. An index value of 1 implies a level of regulation one standard deviation above the national average. An index value of −1 implies a level of regulation one standard deviation below the national average.

Sources: Edward L. Glaeser and Joseph Gyourko (2008), *Rethinking Federal Housing Policy: How to Make Housing Plentiful and Affordable*, Washington, D.C., AEI Press (https://www.aei.org/wp-content/uploads/2014/03/-rethinking-federal-housing-policy_101542221914.pdf)

Why housing price cycles? A structural interpretation

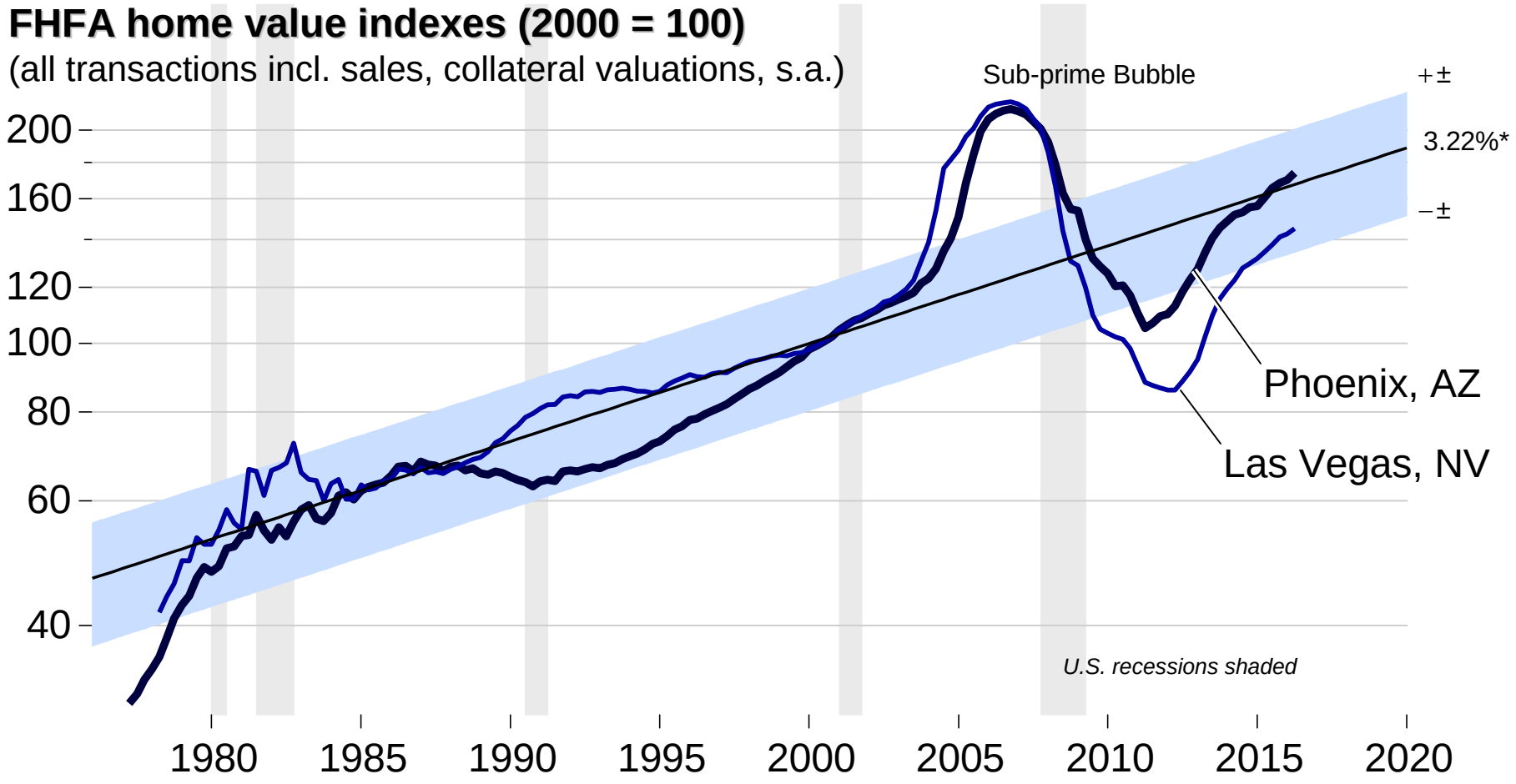
- Some markets exhibited steady log-linear appreciation until sub-prime mortgage lending turned them into bubblicious markets (examples: Phoenix, Loss Vegas)
- Some markets cyclical because geographic constraints (mountains, ocean) interact with regulatory constraints (environmental authoritarianism*) to restrict the housing production response—low price elasticity of new housing supply in Hawaii
- Absent "frothy" credit conditions, geographic constraints, and regulatory impediments, bubbles/cycles dampened, smoother price trajectories (e.g. Iowa)
- Constraints—geographic and regulatory—on new home supply "bandwidth" imply that macroeconomic drivers for housing demand such as low interest rates or microeconomic drivers (sub-prime mortgage lending), cause faster short-run house price increases in constrained markets (Hawaii) than in unconstrained markets (Iowa) even through longer run rates of home price appreciation often converge via arbitrage because of capital and labor mobility (plus return premiums attributable to land scarcity as a consequence of its status as a nonrenewable natural resource with few substitutes, *i.e*. once geographic constraints are binding)

*Using legal process as a coercion tool when neither preference revelation through popular, democratic political institutions, market-based allocation or development entitlement (*e.g*. eBay auctions of the right to build), nor hierarchical economic governance mechanisms—for example, decisions within large landholder institutions or large corporate structures—will suffice.

Two examples familiar to Hawaii, Phoenix and Las Vegas (the 9th island), since 1970s inflation and absent a housing bubble: log-linear prices

FHFA home value indexes (2000 = 100)

(all transactions incl. sales, collateral valuations, s.a.)



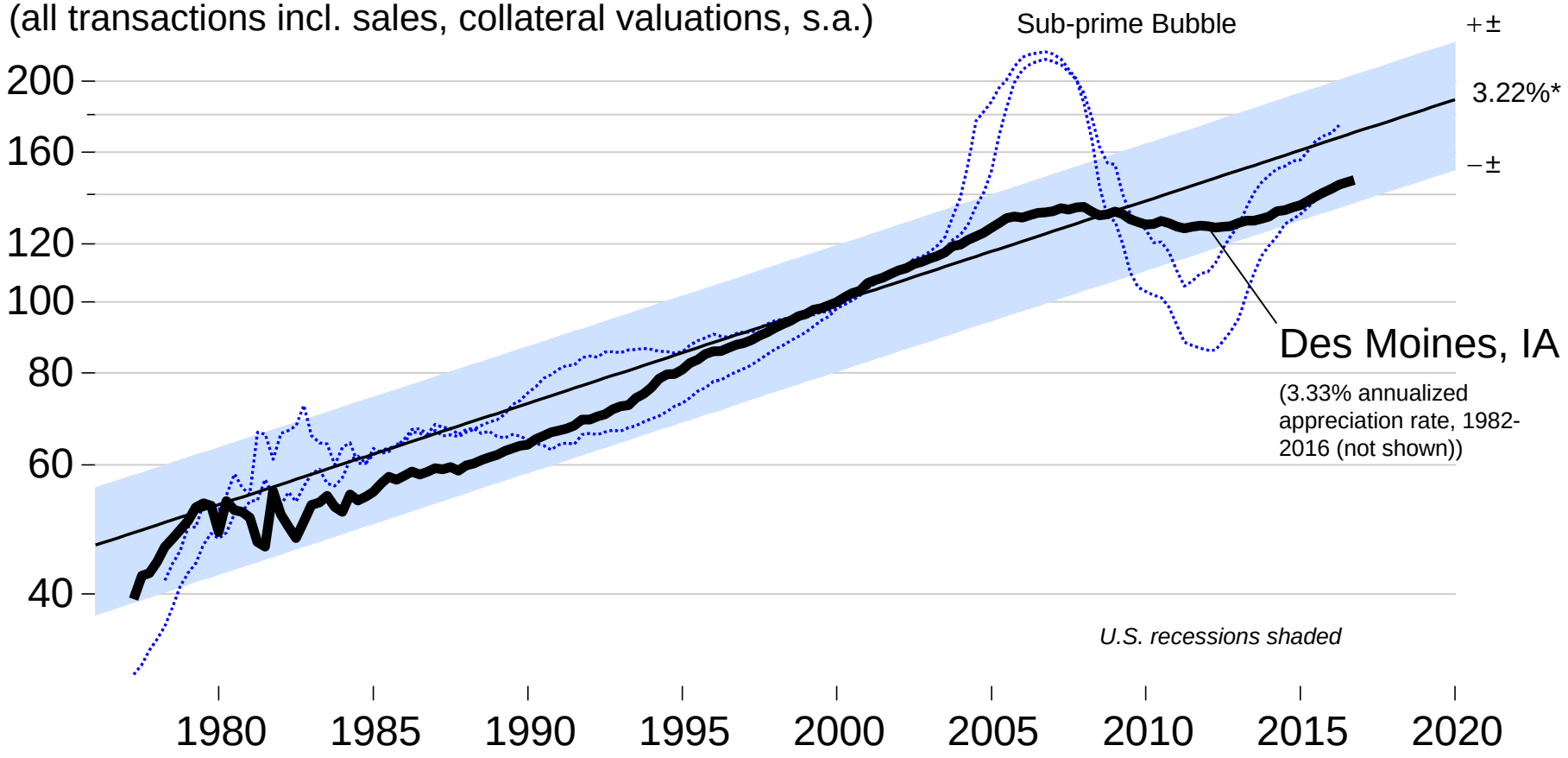
*For comparison, U.S. CPI-U inflation, annualized, 1982-2016, was 2.7 percent

Sources: Federal Housing Finance Administration; rebasing, seasonal adjustment, regression on average of the two indexes by TZ Economics

An even better example absent “steep slopes and water bodies;” if you want a permit to build house they ask “what’s a permit?”

FHFA home value indexes (2000 = 100)

(all transactions incl. sales, collateral valuations, s.a.)



*U.S. CPI-U inflation, annualized, 1982-2016, was 2.7 percent; compare to composite Las Vegas + Phoenix annualized house price appreciation rate as shown

Sources: Federal Housing Finance Administration; rebasing, seasonal adjustment, regression on average of the two indexes by TZ Economics

Keeping up with the literature?

- "The affordable housing debate should be broadened to encompass zoning reform, not just public or subsidized construction programs...we believe the evidence suggests that zoning is responsible for high housing costs, which means that if we are thinking about lower housing prices, we should begin with reforming the barriers to new construction in the private sector"

  Edward L. Glaeser and Joseph Gyourko
  "The Impact of Building Restrictions on Housing Affordability"
  Federal Reserve Bank of New York Economic Policy Review (June 2003)

- "I find that supply constraints increase volatility through two channels: First, regulation lowers the elasticity of new housing supply by increasing lags in the permit process and adding to the cost of supplying new houses on the margin. Second, geographic limitations on the area available for building houses, such as steep slopes and water bodies, lead to less investment on average relative to the size of the existing housing stock, leaving less scope for the supply response to attenuate the effects of a demand shock. My estimates and simulations confirm that regulation and geographic constraints play critical and complementary roles in decreasing the responsiveness of investment to demand shocks, which in turn amplifies house price volatility."

  Andrew D. Paciorek
  "Supply Constraints and Housing Market Dynamics"
  Federal Reserve Board Finance and Economics Discussion Series WP 2012-01 (December 2011)

The definitive Honolulu study by UHERO "Inclusionary Zoning: Implications for Oahu's Housing Market" (Feb. 2010)

1. "Inclusionary Zoning (IZ) policies have failed in other jurisdictions and are failing on Oahu. IZ reduces the number of 'affordable' housing units and raises prices and reduces the quantity of 'market-priced' …units."
2. Housing un-affordability is cyclical; in the 20-teens not too bad on Oahu
3. IZ policies in Kakaako and elsewhere reduce profitability (including margin for risk) and pre-empt capital markets financing new housing
4. "Eliminating IZ and easing development regulations will result in more housing units and lower housing prices."

IZ is not currently working on Oahu. Overall, IZ policies reduce the number of "affordable" housing units, while raising prices and reducing the number of "market-priced" housing units. Eliminating inclusionary zoning and easing development regulations will result in more housing units and lower housing prices (UHERO 2010).

Source: Carl Bonham, Kimberly Burnett, and Andrew Kato (February 12, 2010) *Inclusionary Zoning: Implications for Oahu's Housing Market* (http://www.uhero.hawaii.edu/assets/UHEROProjectReport2010-1.pdf)

Recapping the literature and recommendation

- In the long-run, labor (population) and capital mobility imply that total returns on housing as an asset class will broadly match those elsewhere within an economic union:
  1. Total return is sum of capital gain and dividend
  2. Capital gain is house price appreciation
  3. Dividend comprises housing services (you get to live in the asset, unlike stocks)
  4. Risk-adjusted returns equate over time—housing earns a risk premium
- "Steep slopes and water bodies" impose natural, geographic constraints on development that the housing economics literature identifies in amplification of house price volatility
- Inclusionary zoning (Affordable Housing quotas), other regulatory constraints, aggravate the consequences of natural constraints, even when well-intentioned (agricultural preservation, watershed conservation, "ua mau ke ea o ka aina i ka pono," *etc*.)
- The cyclical window of affordability is going to slam shut, *again*—even with (and faster without) accommodative interest rates—it's only open momentarily once a cycle
- Turn housing policy on its head: make it *as easy as is possible* for builders to respond to incipient price rise below some arbitrary threshold (*e.g*. the median price)—THINK eBay, "you know there is enough entitlement when its price in the secondary market is zero"

Summarizing, thus far

- The cost of living premium for Honolulu over U.S. metropolitan areas has averaged around 20-25 percent for 70 years by a variety of measures (ranging as widely as 15-30 percent), less perhaps for the Neighbor Islands (East Hawaii Island (Hilo side) is relatively affordable), mostly because of housing cost.
- Perfect capital mobility within the United States (part of the definition of economic union that Makes America Great Already) means that arbitrage drives Hawaii and Oahu home prices—adjusted for inflation—towards annual appreciation similar to the long-run real rate of return on capital in the U.S., approximately 2 percent.
- It is unlikely that solving the "affordable housing" problem in Hawaii, which has little to do with homelessness, *per se**, may or may not have a material impact on living cost differentials, which may be a long-run equilibrium condition balancing intrastate migration flows. Still, such a solution (more housing) can't hurt.
- Simply enabling the production of more, *much more,* new housing of *any* kind *will* materially contribute to affordable housing access, which economics literature suggests is constrained in Hawaii by unusually restrictive development entitlement allocation, an artificial form of regulatory scarcity that compounds the effects of geographic scarcity ("steep slopes and water bodies"). Public policy cannot change geography. What's left?

*Homelessness is primarily a consequence of the de-institutionalization of mental health treatment, the pattern of substance abuse, veterans' issues (which are not mutually-exclusive with respect to the first two), and economic misfortune characterized by a high degree of economic mobility (today's bad luck individual is not the same as tomorrow's), combined with absence of a credible threat of enforcement of protections for private or public property against squatting.

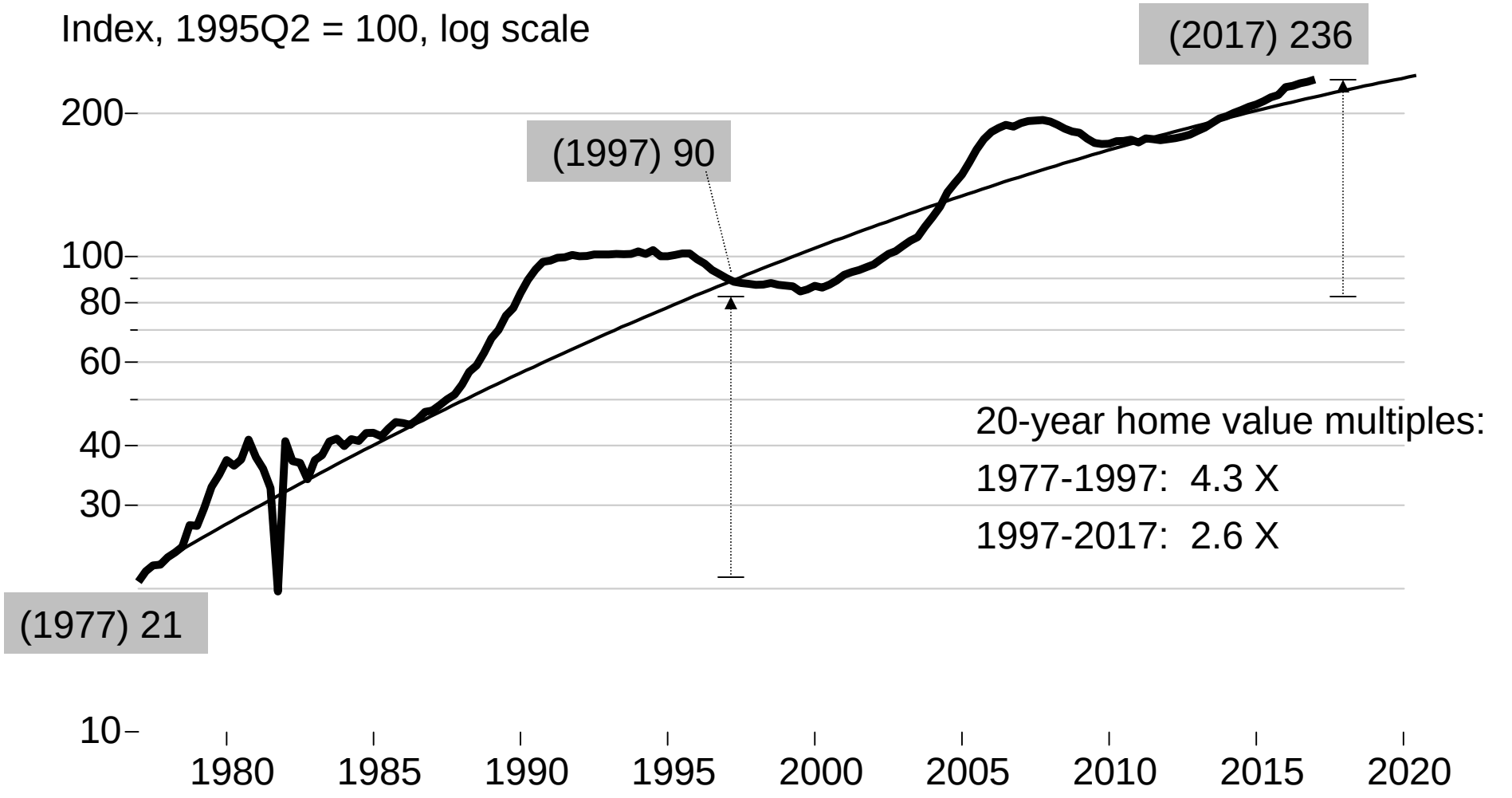
Pau (lecture 1 of 2)

TZ ECONOMICS

Take a moment to think about the difference (if one exists) between “resilience” and LR convergence to an asset price trajectory

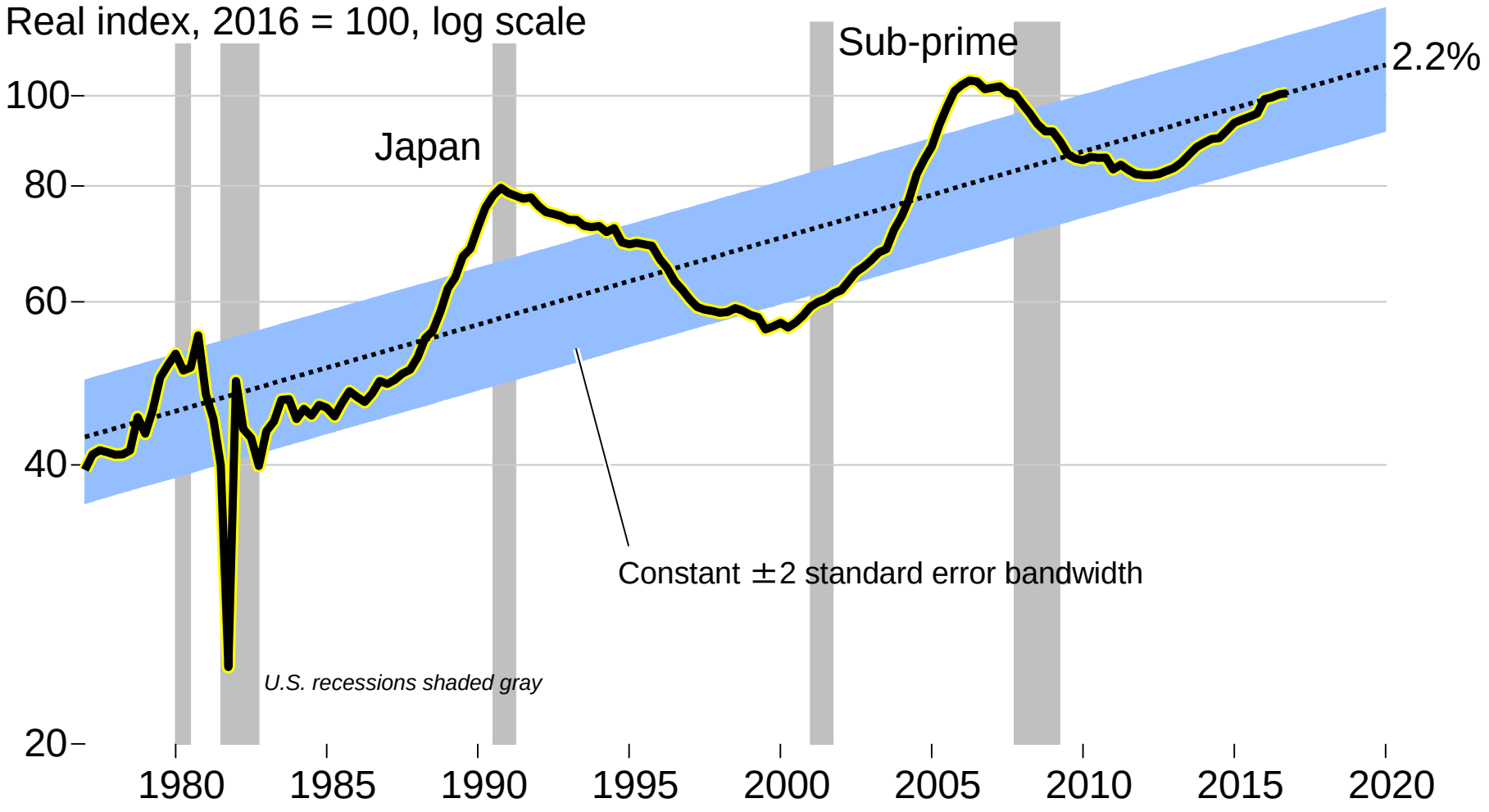
More on housing asset price dynamics

Visualizing long-term trend *deceleration* of nominal Oahu housing valuations: progress toward lower inflation



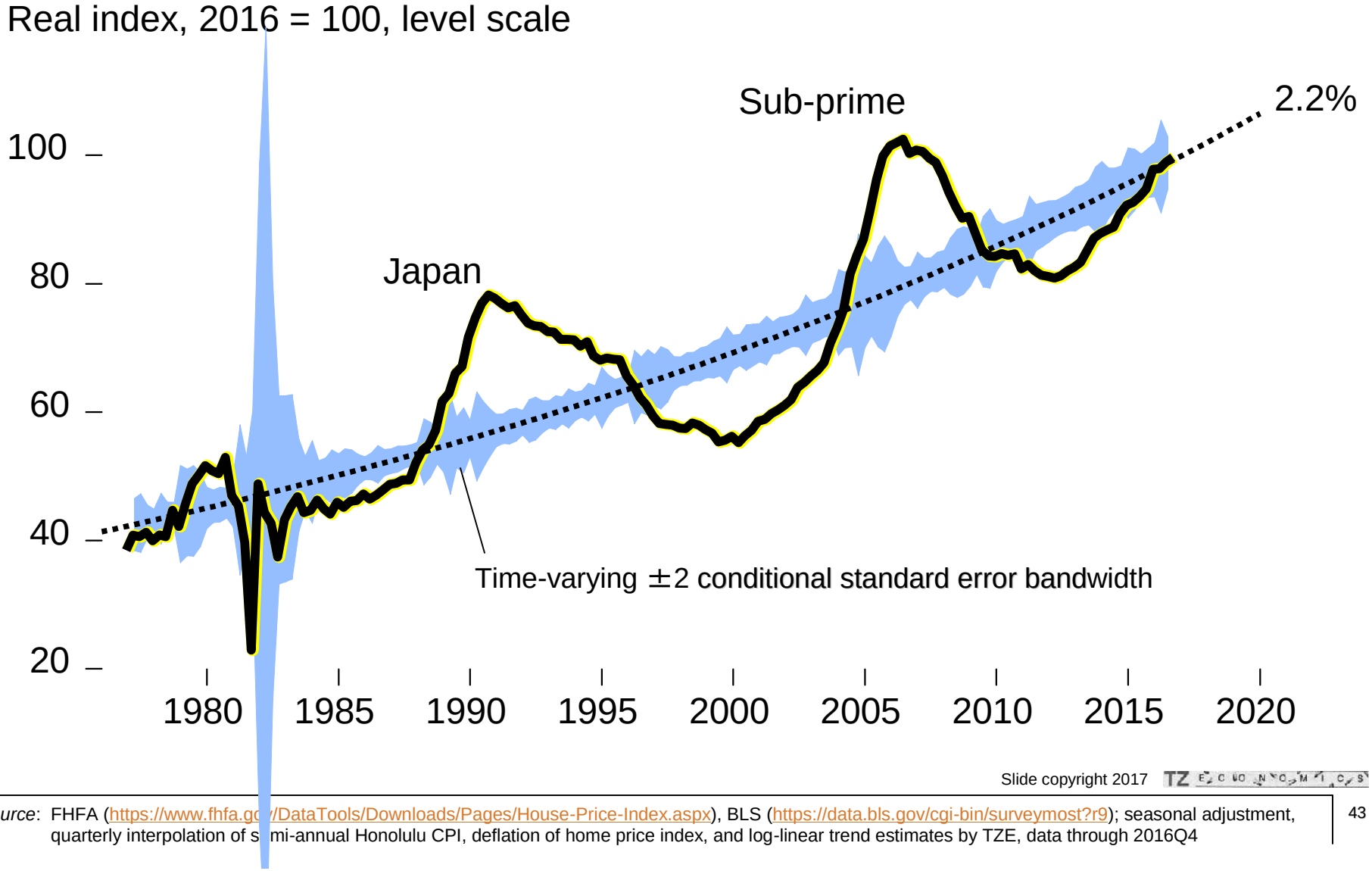
Source: Federal Housing Finance Administration (https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx), a weighted, repeat-sales (all-transaction) index of Urban Honolulu MSA home prices; seasonal adjustment by TZE

Adjust Honolulu home valuations for consumer price inflation so that they are re-stated in real terms, in constant 2016 prices



Source: FHFA (https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx), BLS (https://data.bls.gov/cgi-bin/surveymost?r9); seasonal adjustment, quarterly interpolation of semi-annual Honolulu CPI, deflation of home price index, and log-linear trend estimates by TZE

Taking into account t*ime-varying* volatility: Oahu home prices adjusted for inflation appreciated at about a 2% real rate



Source: FHFA (https://www.fhfa.gov/DataTools/Downloads/Pages/House-Price-Index.aspx), BLS (https://data.bls.gov/cgi-bin/surveymost?r9); seasonal adjustment, quarterly interpolation of semi-annual Honolulu CPI, deflation of home price index, and log-linear trend estimates by TZE, data through 2016Q4

June 3, 2013

Star-Advertiser

THE PULSE of PARADISE

CONDO MANIA!

The nearly 5,000 units planned for the city's urban core are expected to meet pent-up demand — or could even fall short

By Andrew Gomes
agomes@staradvertiser.com

Lanikea. Hokua. Ko'olani. Capitol Place. Keola La'i. Moana Pacific. The Watermark. Allure Waikiki. Pacifica Honolulu. Holomua.

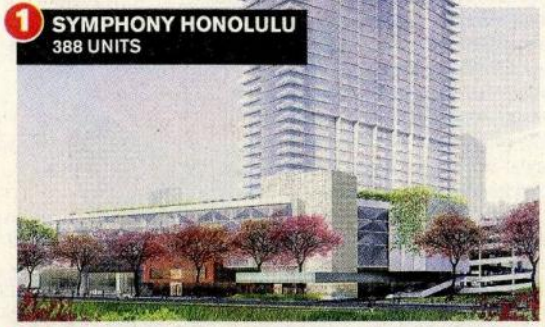
These condominium towers in Honolulu were the product of the last real estate market boom, which prompted developers to build close to 4,000 new units in more than a dozen towers that also included The Pinnacle, 909 Kapiolani and 215 N. King.

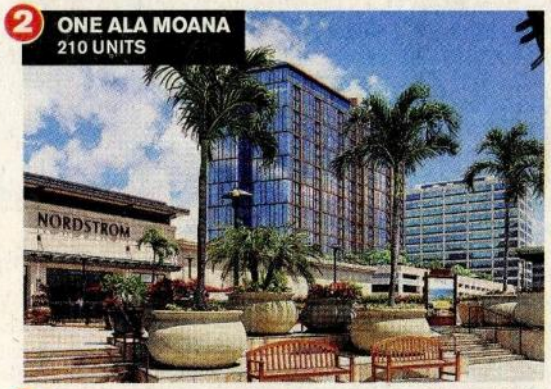
number of high-rise homes — almost 5,000, including 1,000 rental units — in Oahu's urban core?

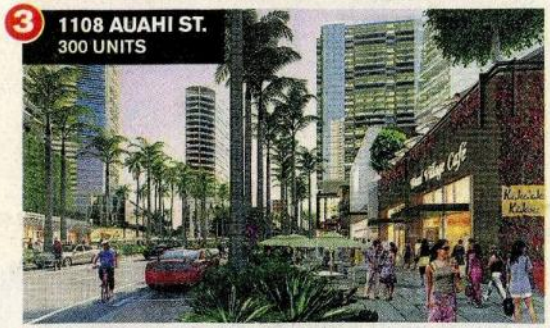
To some observers it's hard to imagine demand meeting such a supply.

But developers, along with a local economist and a real estate market analyst, contend that all the projects planned to date won't produce a glut.

"It's not a question of will there be enough buyers," said economist Paul Brewbaker of Honolulu-based TZ Economics. "The problem is, will there be enough condos?"







City kills attempt to reduce habitual 911 calls

Paramedics would have visited the most frequent users of ambulances to get them appropriate care

By Susan Essoyan
sessoyan@staradvertiser.com

A "community paramedic" program intended to reduce overuse of ambulances by chronic 911 callers has been dropped by the new city administration, but the state hopes to start a similar effort.

The Honolulu Emergency Services Department, led at the time by Dr. James Ireland, created a community paramedic team in November after research revealed that the top 10 callers to 911 had taken an average of 52 ambulance rides per year. One logged 142 trips in the year before he died.

The plan was for two community paramedics to

Decomposing house prices into implied valuations for land and reproducible structures (like property taxes)

- House values weighted average of values structure and land; land weight rising
- Supply and demand for housing:
  1. **Demand**: structure is capital input in home production, leisure; land capitalizes value of schools, commuting distances, views, microclimates, *etc*.
  2. **Supply**: structures are easily reproduced; desirable residential land is not; asymmetry means demand increases have different effects on components
- Cost of new structures = construction cost + cost of acquiring entitlement
- Land is non-reproducible, land prices three times as volatile as prices of structure
  1. Land's share of new home prices is relatively small, larger share of the entire housing stock, explaining why price growth for existing homes outpaces new
  2. Regions where land is large share of housing value (HNL, SFO, BOS) more sensitive to demographics, interest rates, demand-side drivers rather than construction costs, and experience higher appreciation and greater volatility
  3. Land's value share trending upward; implications for portfolio allocation (incentive for people in high-priced areas to buy more low-risk bonds and fewer risky stocks)

Source: Morris A. Davis and Jonathan Heathcote (November 2006), "The Price and Quantity of Residential Land in the United States," *Journal of Monetary Economics* **Vol, 54**, Issue 8, November 2007, Pages 2595–2620

Land and scarcity

"Clearly, land is something that home-buyers are willing to pay handsomely for, and that developers cannot cheaply incorporate in new homes. This scarcity requirement suggests that attributes such as good local schools, low crime, or a pleasant climate are by themselves insufficient to generate high long-term land values, because as long as developers can keep building new homes in low-crime, good-school, sunny-weather neighborhoods, house prices will not rise far above construction costs. There are two ways scarcity can arise. First, land-use restrictions may prevent developers from building enough new homes to align prices with construction costs. Second, scarcity can arise naturally. Suppose that part of the iconic middle-class lifestyle to which many Americans aspire is to own a detached house with a yard for the children and a short commute to work. In many cities developers cannot increase the supply of these homes for the simple reason that all the relatively central land has already been developed..."

Source: Morris A. Davis and Jonathan Heathcote (November 2006), "The Price and Quantity of Residential Land in the United States," *Journal of Monetary Economics* **Vol, 54**, Issue 8, November 2007, Pages 2595–2620

Legacy of affordable motor vehicular transport

"We have in mind a simple story than can perhaps account both for the decline in land prices between 1930 and 1950 and the upward trend since then. The interpretation of the decline is not new. As the cost of automobiles fell over the first half of the twentieth century car ownership surged, such that by 1950 there were almost as many cars as housing units in the United States: 40.3 million versus 46.1 million. As new roads were built, the quantity of land within reasonable commuting distance of city centers expanded rapidly. This increase in the supply of potential residential land has been put forward as a likely explanation for the decline in land prices over this period. Since the widespread adoption of the automobile there have been no further significant technological innovations in passenger transportation. Over time, more and more cities have either developed most of the land within reasonable commuting distance of the city center, or in a few cases have implemented policies to slow further development. Thus growth in the supply of desirable residential land has not been sufficient to accommodate growth in demand for housing, and land and house prices have risen. This explanation for the u-shape in the value of land over the past century awaits a more formal evaluation in the context of an explicit quantitative theoretical model."

Source: Morris A. Davis and Jonathan Heathcote (November 2006), "The Price and Quantity of Residential Land in the United States," *Journal of Monetary Economics* **Vol, 54**, Issue 8, November 2007, Pages 2595–2620

The Economic Implications of Housing Supply (Glaeser and Gyourko (2017 forthcoming))

- Three core facts about housing supply:
  1. When building is unrestricted by regulation or geography, housing supply curves seem relatively flat (in our stock-flow model, the path of the housing stock)
  2. Where binding, constraints from geography and regulation severely restrict the ease of building, limiting land, lengthening time-to-build, reducing new house flow
  3. Stock supply of housing is kinked and vertical downwards (housing is durable capital, so when demand falls, housing stock does not decline (*e.g*. Detroit))
- Honolulu is a housing market with prices well above "minimum profitable production cost (MPPC)," limited by land availability and land use regulations, causing widening divergence between market prices and fundamental production costs
- Inelastic housing supply is a late-20th century urban phenomenon
  1. Essentially, property rights transferred from land owners to wider community
  2. Power of anti-growth political movements, environmentalism more broadly
  3. Marginal social costs overwhelming marginal private benefits of marginal house
- Economic consequences: contribution to rise in capital share of aggregate income, gains among richest members of oldest cohorts, reduction in housing wealth of young adults, wealth redistribution from buyers to select group of sellers, lower output

Source: Ed Glaeser and Joe Gyourko (Draft of January 4, 2017), "The Economic Implications of Housing Supply," **Zell/Lurie Working Paper#802** (forthcoming *Journal of Economic Perspectives*)

Long-run investment evidence (aK_t) for Hawaii framing the recent, investment-led upswing

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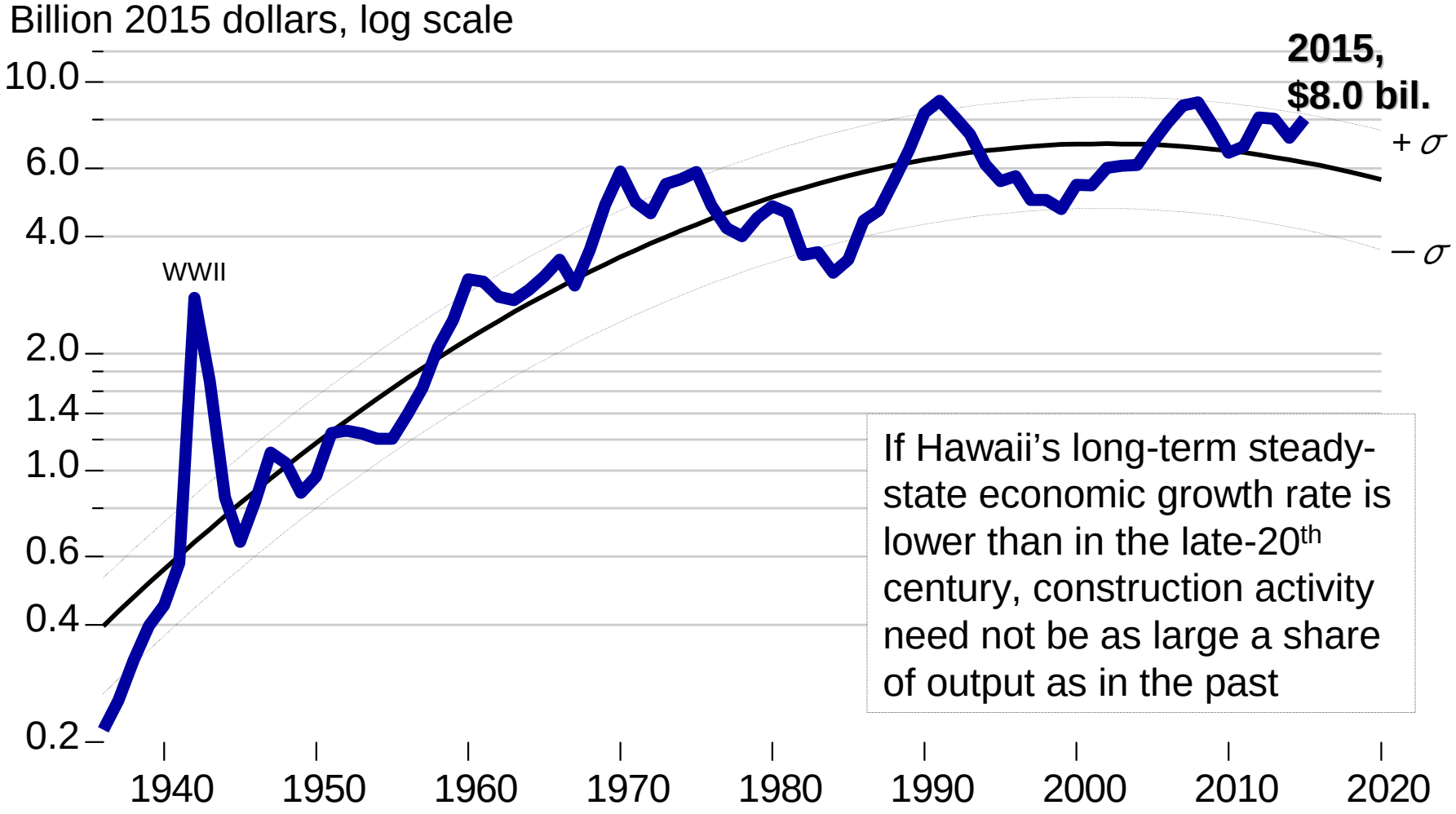
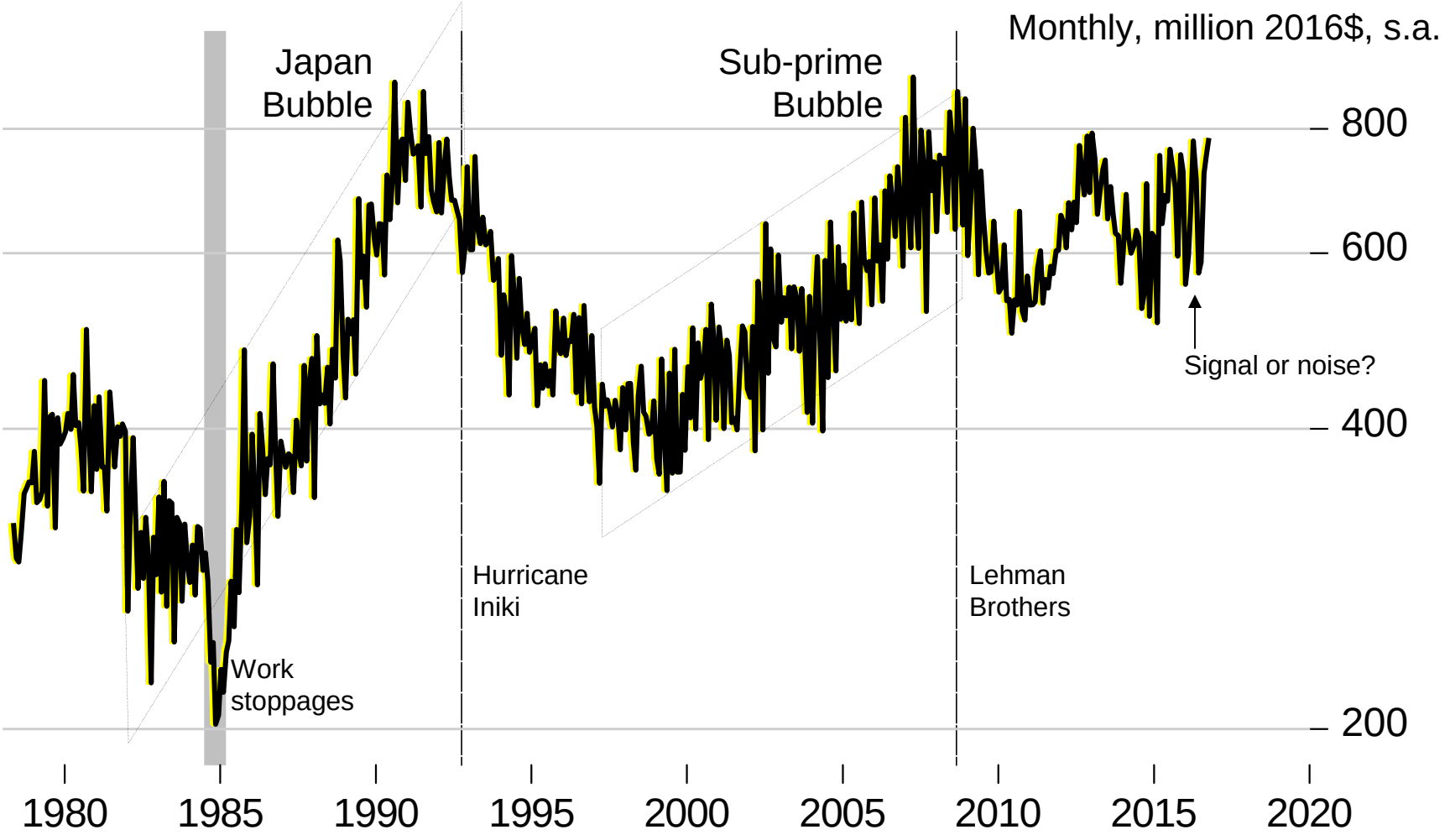
Statewide existential test: if we build for the future, *what* future? Real contracting receipts test a trend hypothesis



If Hawaii's long-term steady-state economic growth rate is lower than in the late-20th century, construction activity need not be as large a share of output as in the past

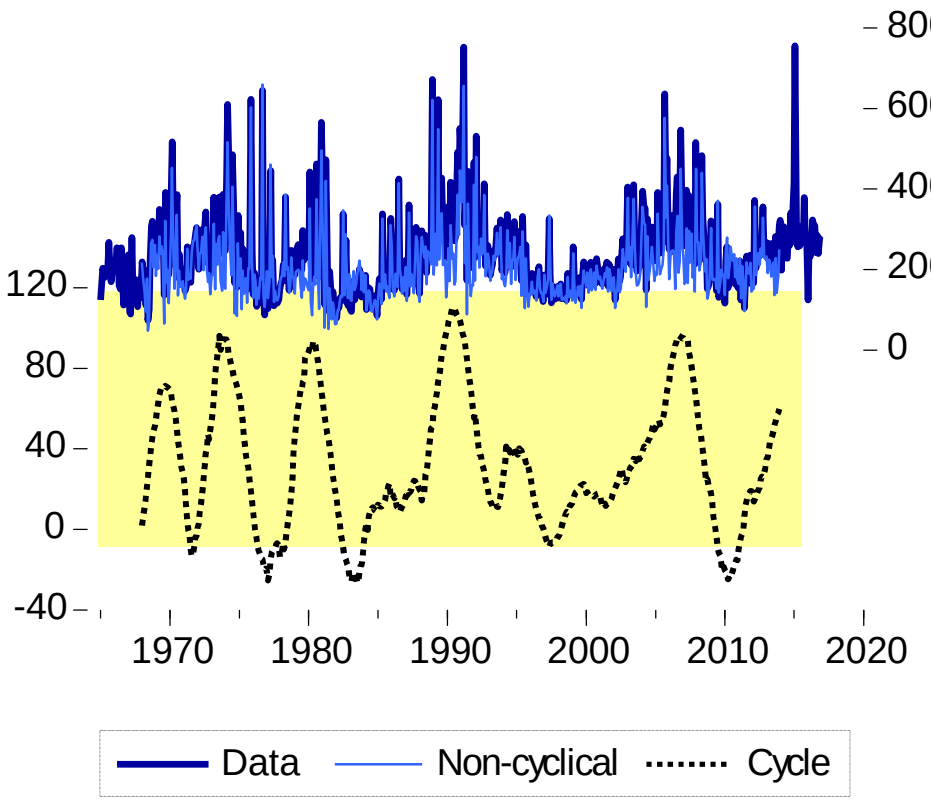
Hawaii statewide real contracting receipts are running out of headroom: turning point or another 2012-13 head fake?



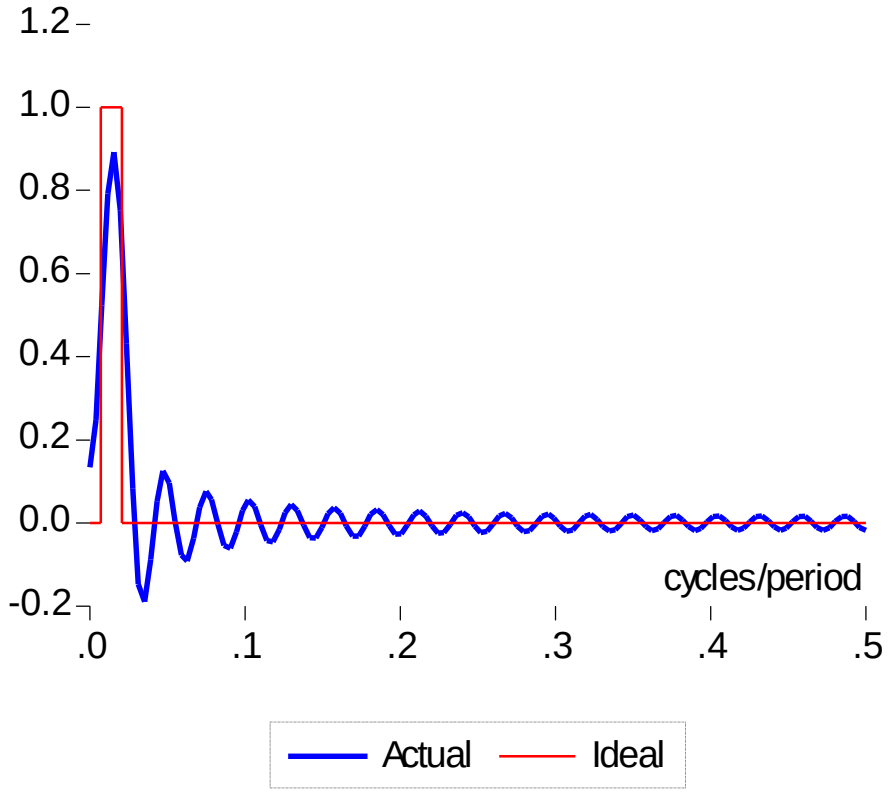
Sources: Hawaii Department of Taxation, Hawaii DBEDT, U.S. Bureau of the Census; seasonal adjustment and deflation using construction cost deflator through September 2016 by TZE

Extracting the cycle in the constant-dollar, monthly (s.a.) value of *private* building permits with a band-pass filter

Fixed Length Symmetric (Christiano-Fitzgerald) Filter

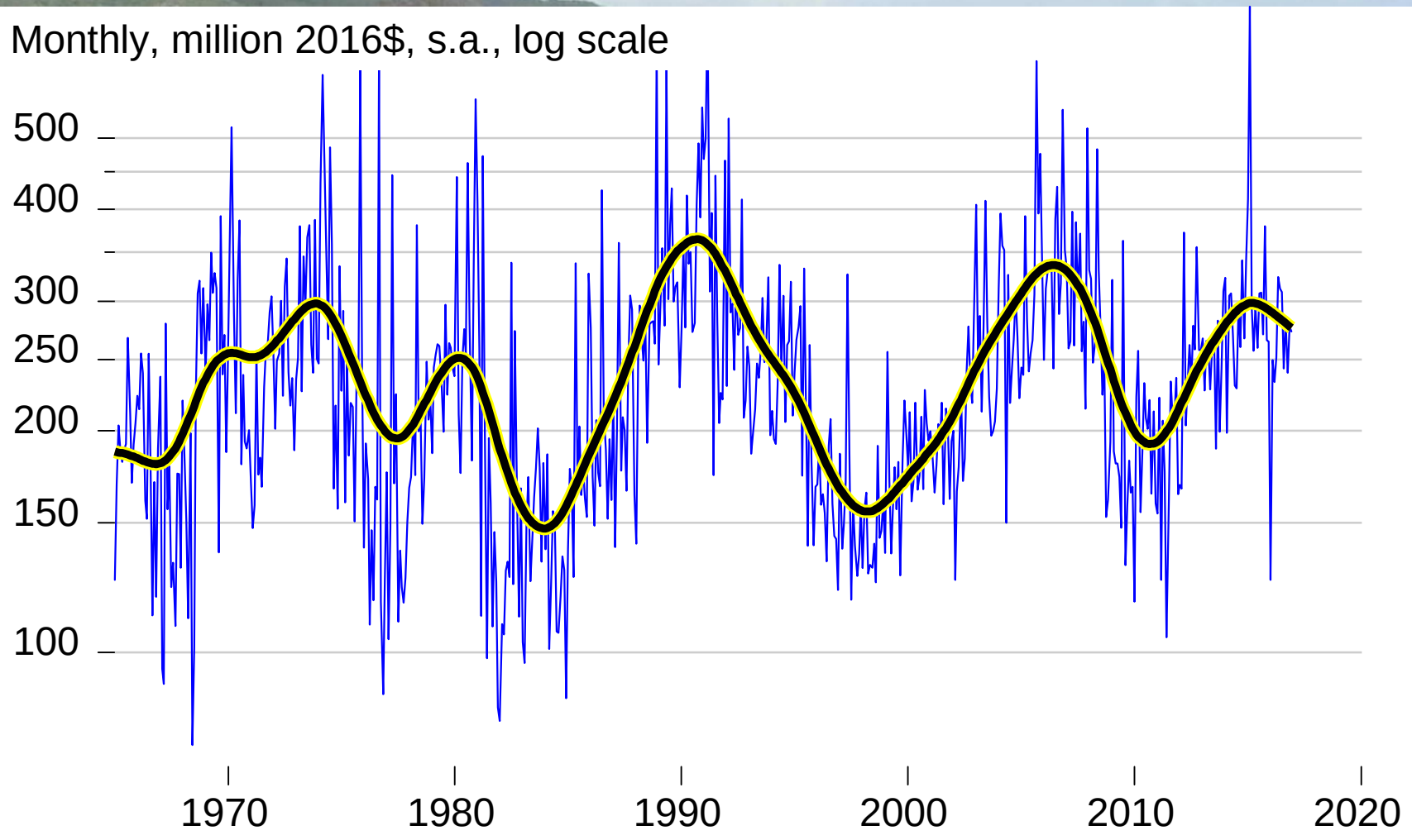


Frequency Response Function



Sources: County Building Departments, Hawaii DBEDT, U.S. Bureau of the Census; seasonal adjustment and deflation using construction cost deflator through December 2016, symmetric band-pass filter with a range of durations from 4 years to 12 years, lead-lag of 36 months, calculated by TZE

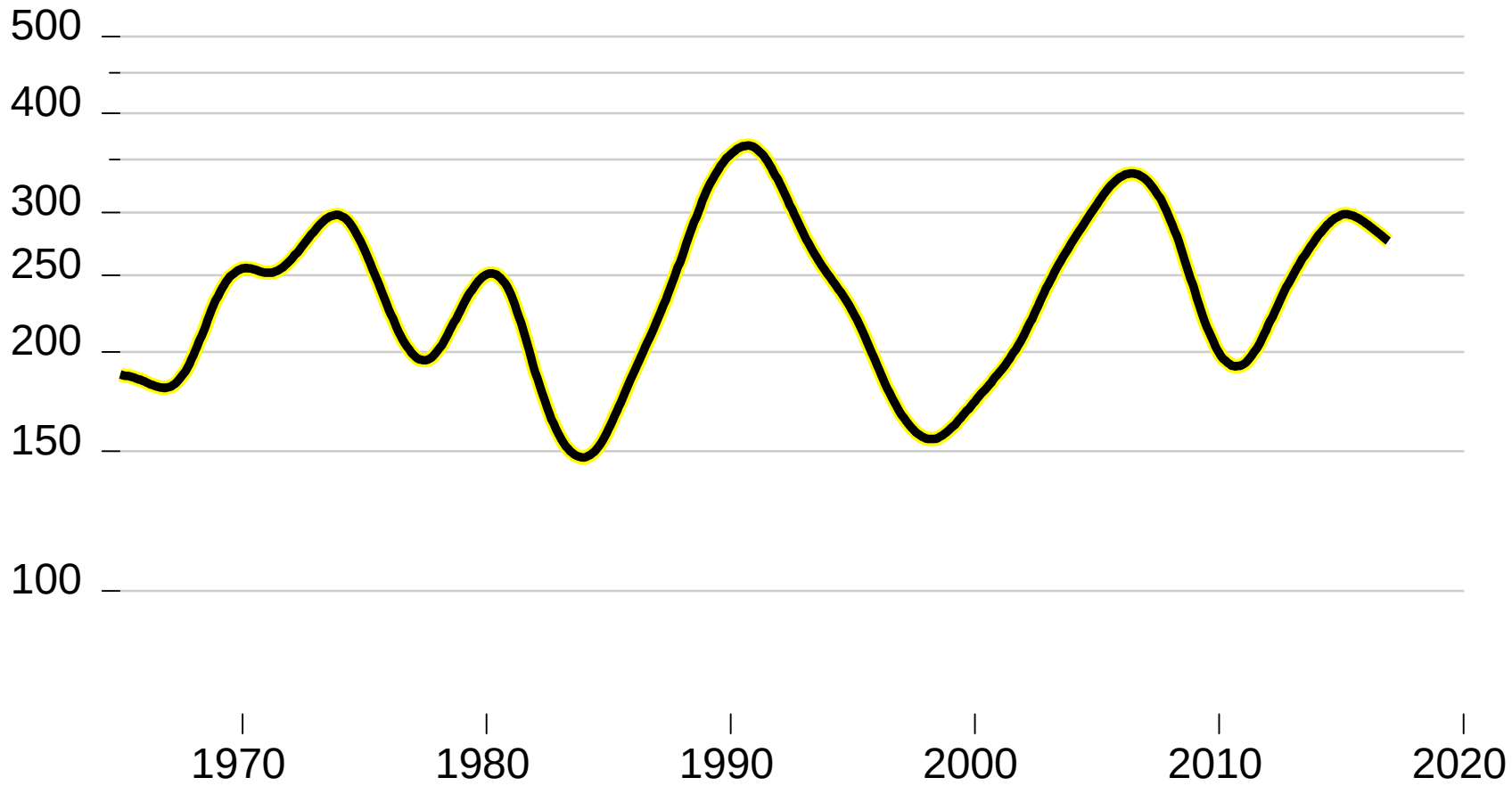
The cycle in Hawaii real private construction commitments jumps out of the data: now past the turning point in current cycle?



Sources: County Building Departments, Hawaii DBEDT, U.S. Bureau of the Census; seasonal adjustment and deflation using construction cost deflator through December 2016 by TZE

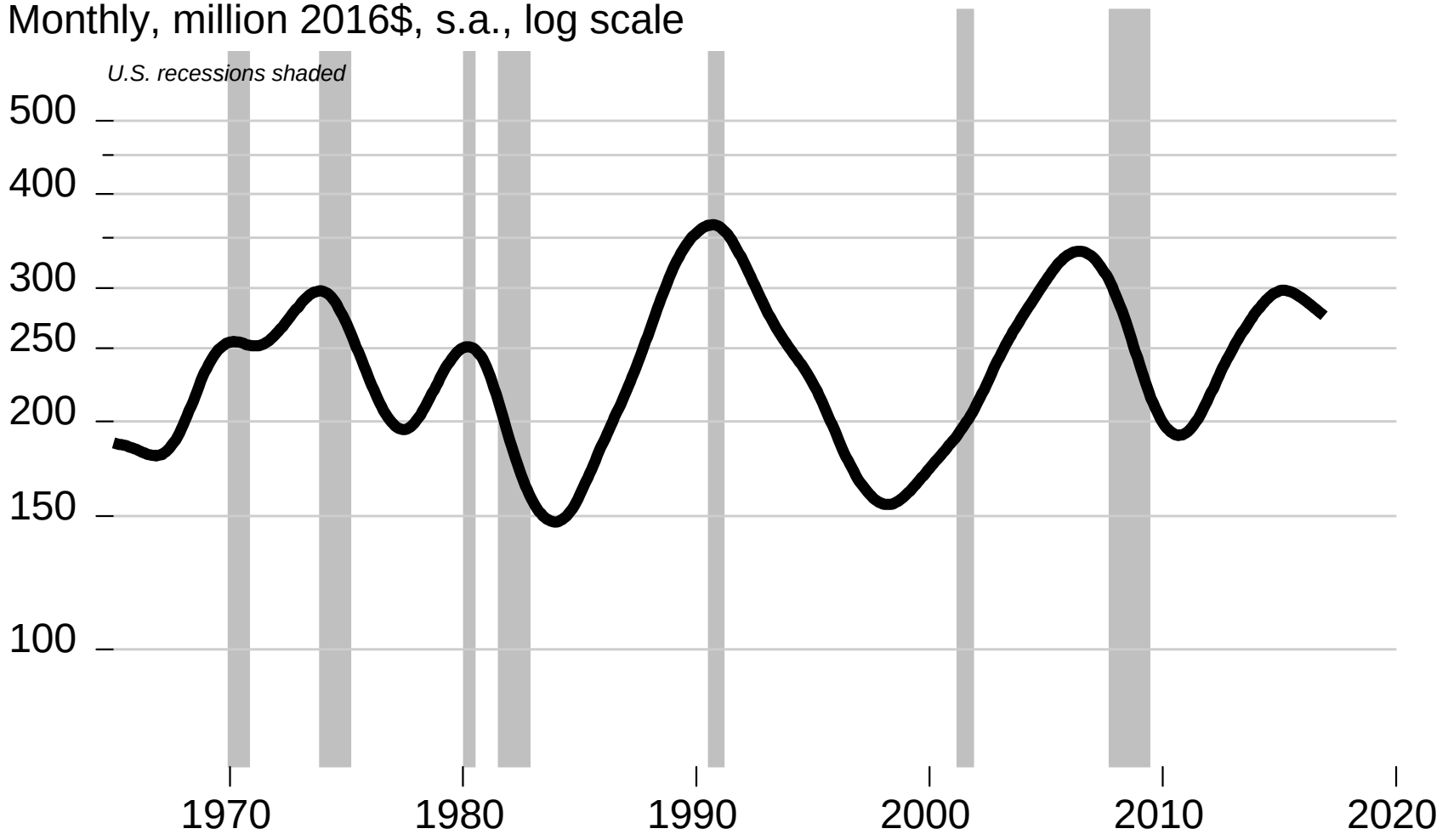
The cycle in Hawaii real private construction commitments jumps out of the data: now past the turning point in current cycle?

Monthly, million 2016$, s.a., log scale



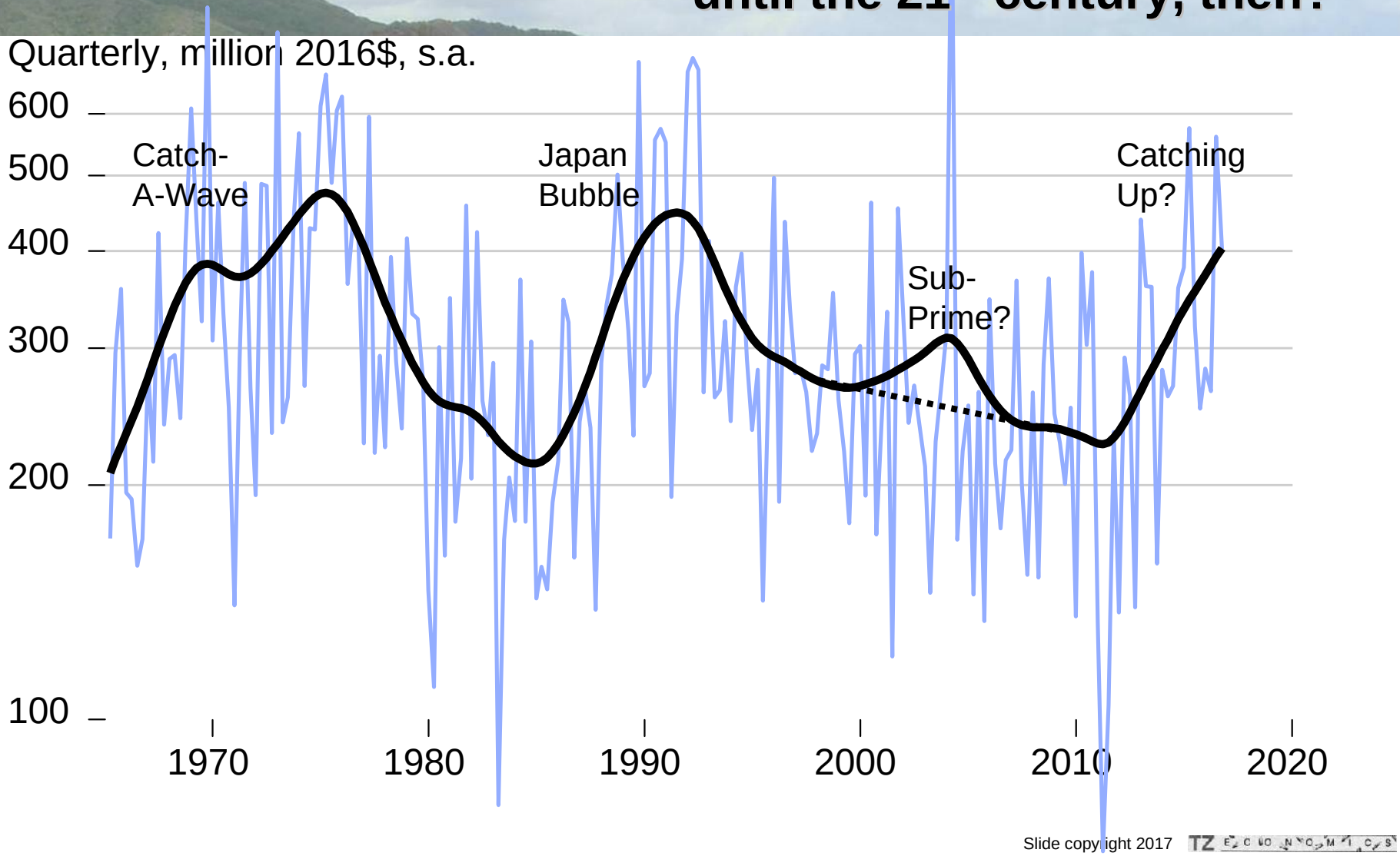
Sources: County Building Departments, Hawaii DBEDT, U.S. Bureau of the Census; seasonal adjustment and deflation using construction cost deflator through December 2016 by TZE

The cycle in Hawaii real private building permit values and U.S. recession dates: is current downturn precursor, anomaly (like à01)?



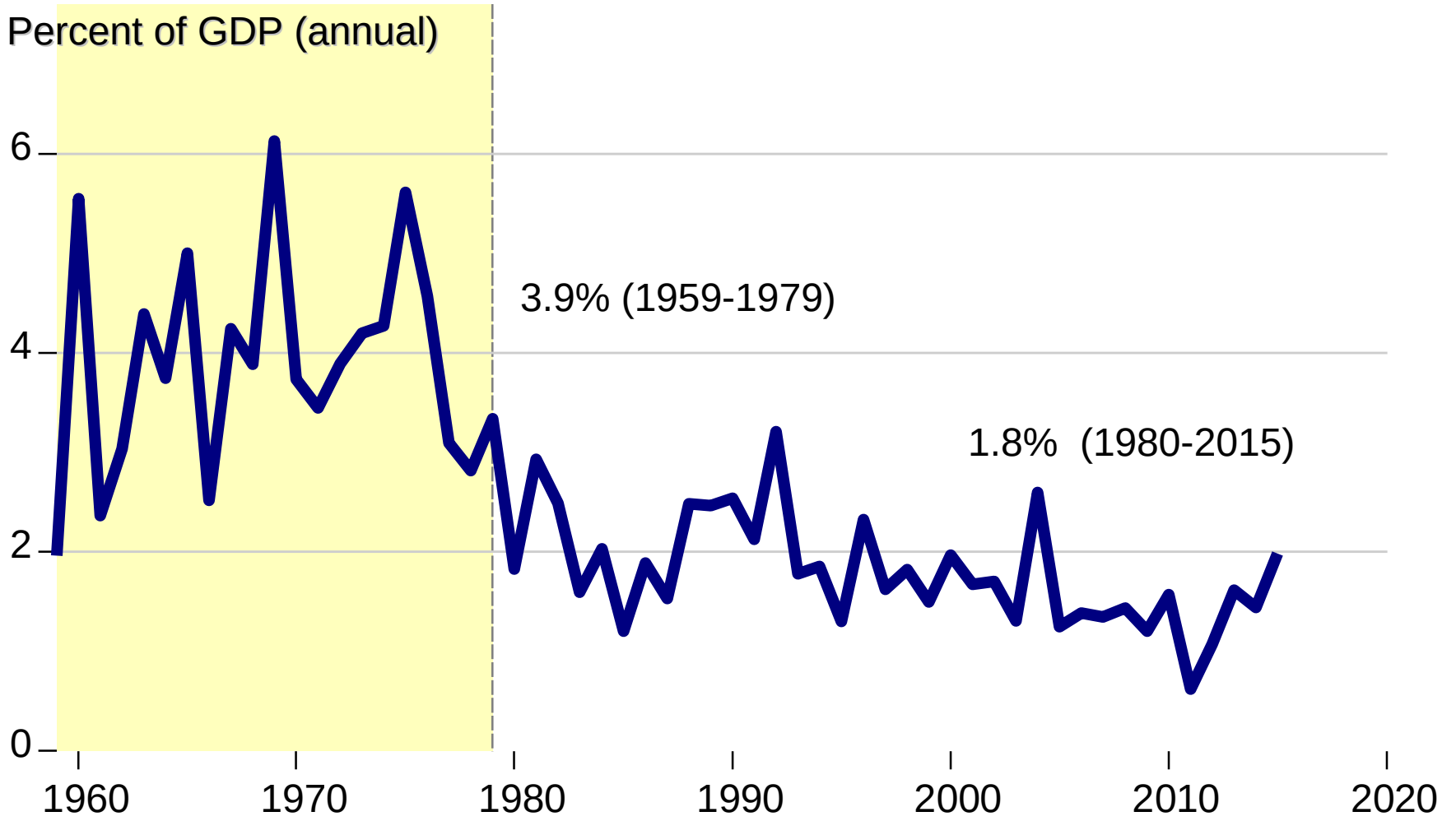
Sources: County Building Departments, Hawaii DBEDT, U.S. Bureau of the Census; seasonal adjustment and deflation using construction cost deflator through December 2016 by TZE

Quarterly real government construction contracts through 2016: procyclical until the 21st century, then?



Sources: Bank of Hawaii, Hawaii DBEDT, U.S. Bureau of the Census; seasonal adjustment and deflation using construction cost deflator through fourth quarter 2016 by TZE

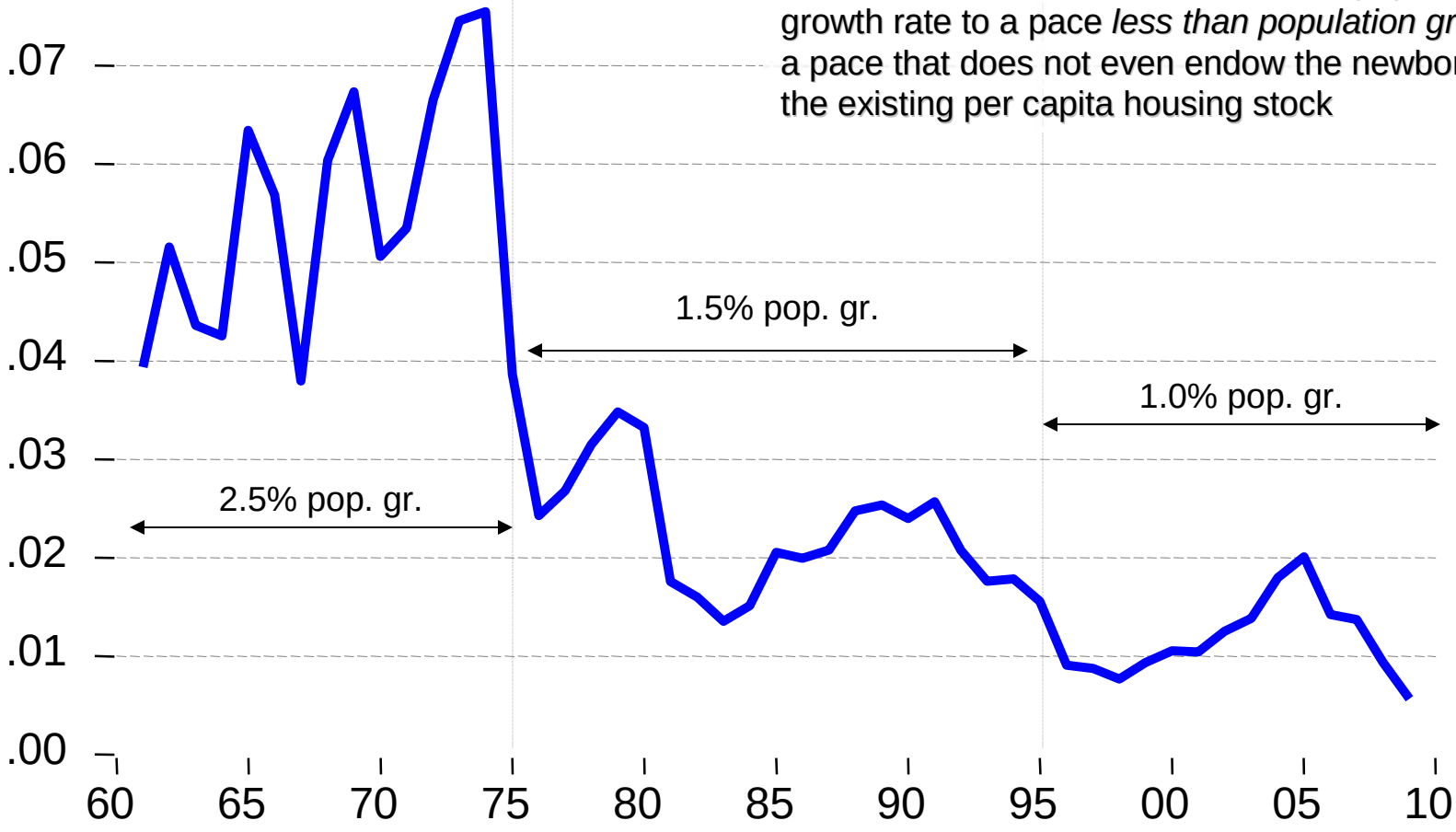
Combined County, State, Federal construction contracts in Hawaii as percent of GDP: after the ’70s infrastructure investment faded



Sources: Bank of Hawaii, First Hawaiian Bank, Hawaii DBEDT, U.S. Bureau of Economic Analysis, TZE; GDP data in the denominator 1959-1962 are Hawaii DPED estimates, 1963-1996 BEA SIC estimates, 1997-2015 BEA NAICS estimates, assuming 3% nominal growth in 2015

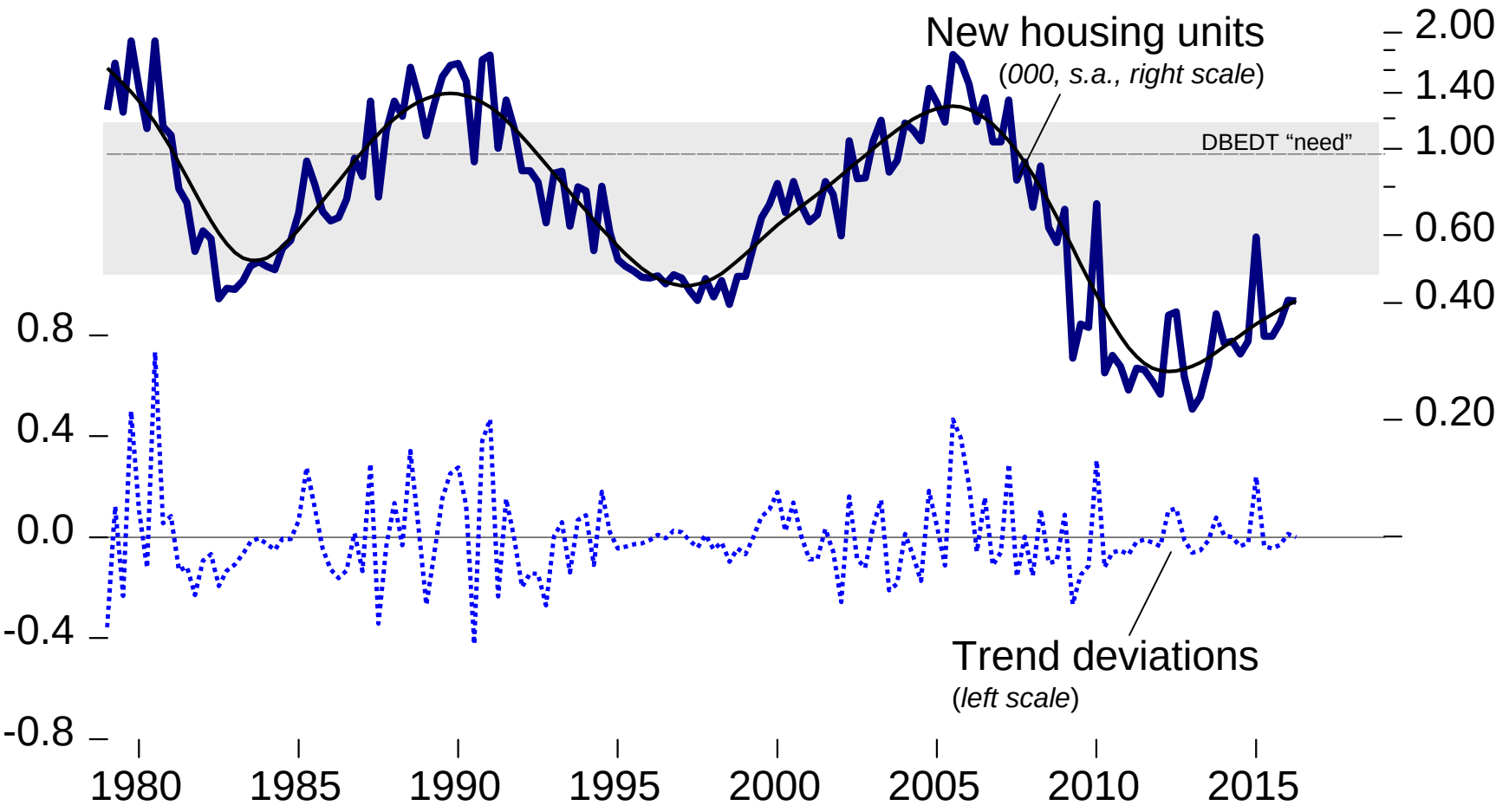
Hawaii new housing units / existing inventory: the investment / capital ratio (aK_t / K_t); too low, and not by accident

Production has fallen *because of regulatory restriction* from two to three times the population growth rate to a pace *less than population growth,* a pace that does not even endow the newborn with the existing per capita housing stock



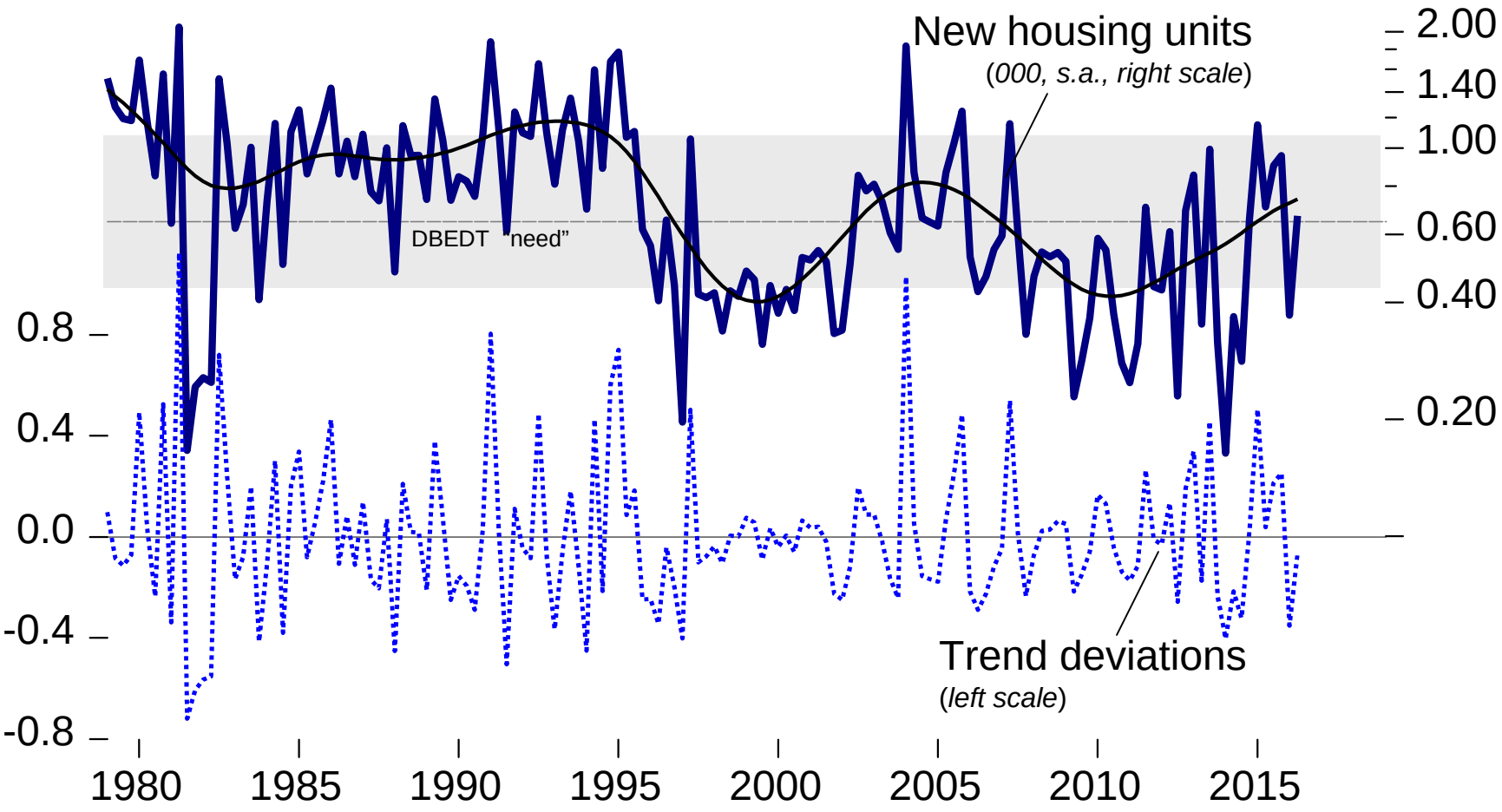
Sources: County Building Departments; Bank of Hawaii; U.S. Bureau of the Census; Hawaii DBEDT; TZE

Neighbor Island quarterly new housing units authorized by building permit have only recovered slightly from deep trough



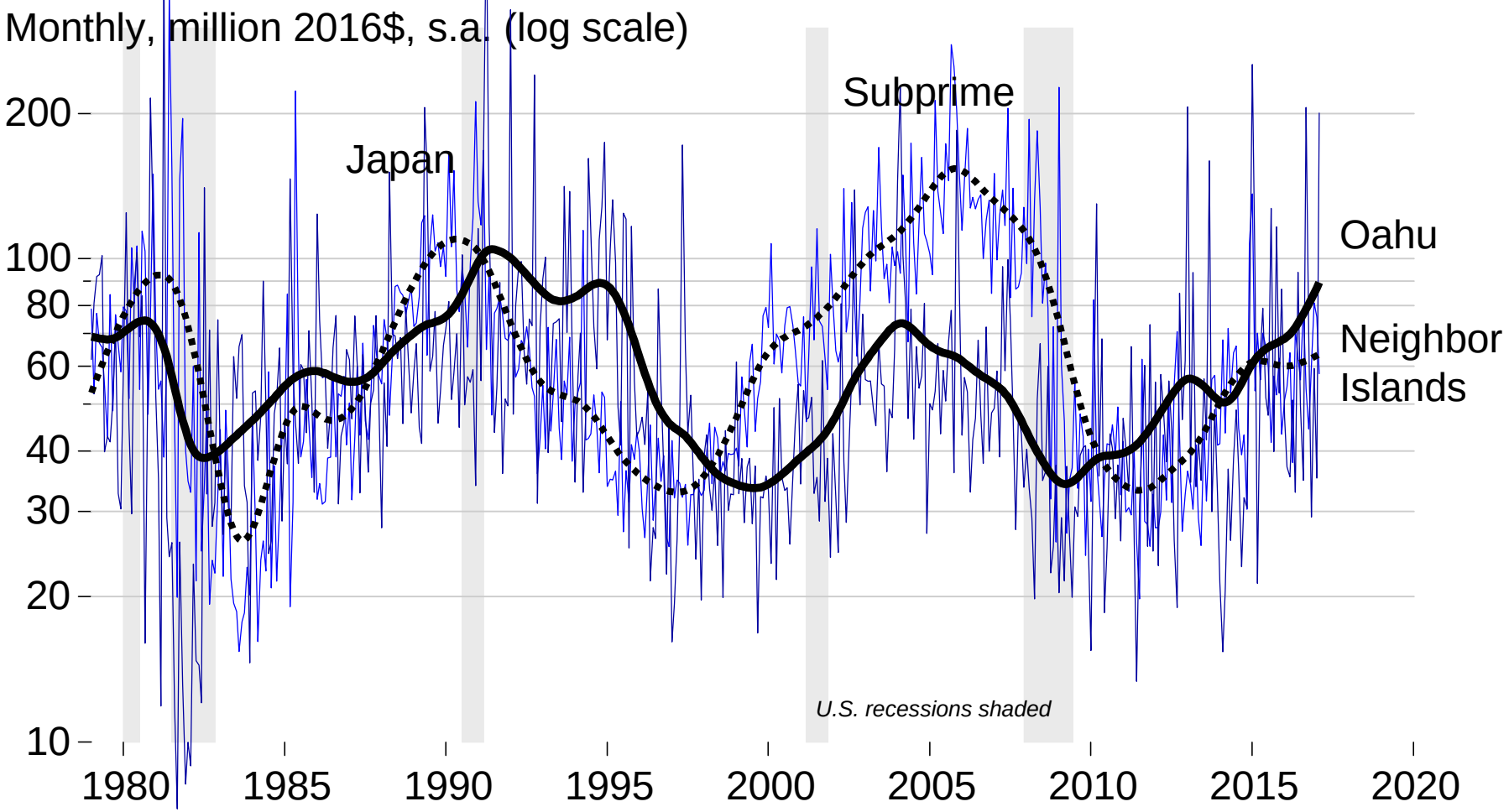
Source: County building departments, Hawaii DBEDT; seasonal adjustment and Hodrick-Prescott filter trend extraction by TZE

Oahu quarterly new housing units authorized:
Q: up or down? A: yes (lumpy high-rises)
Recovery still volatile, obscuring trend



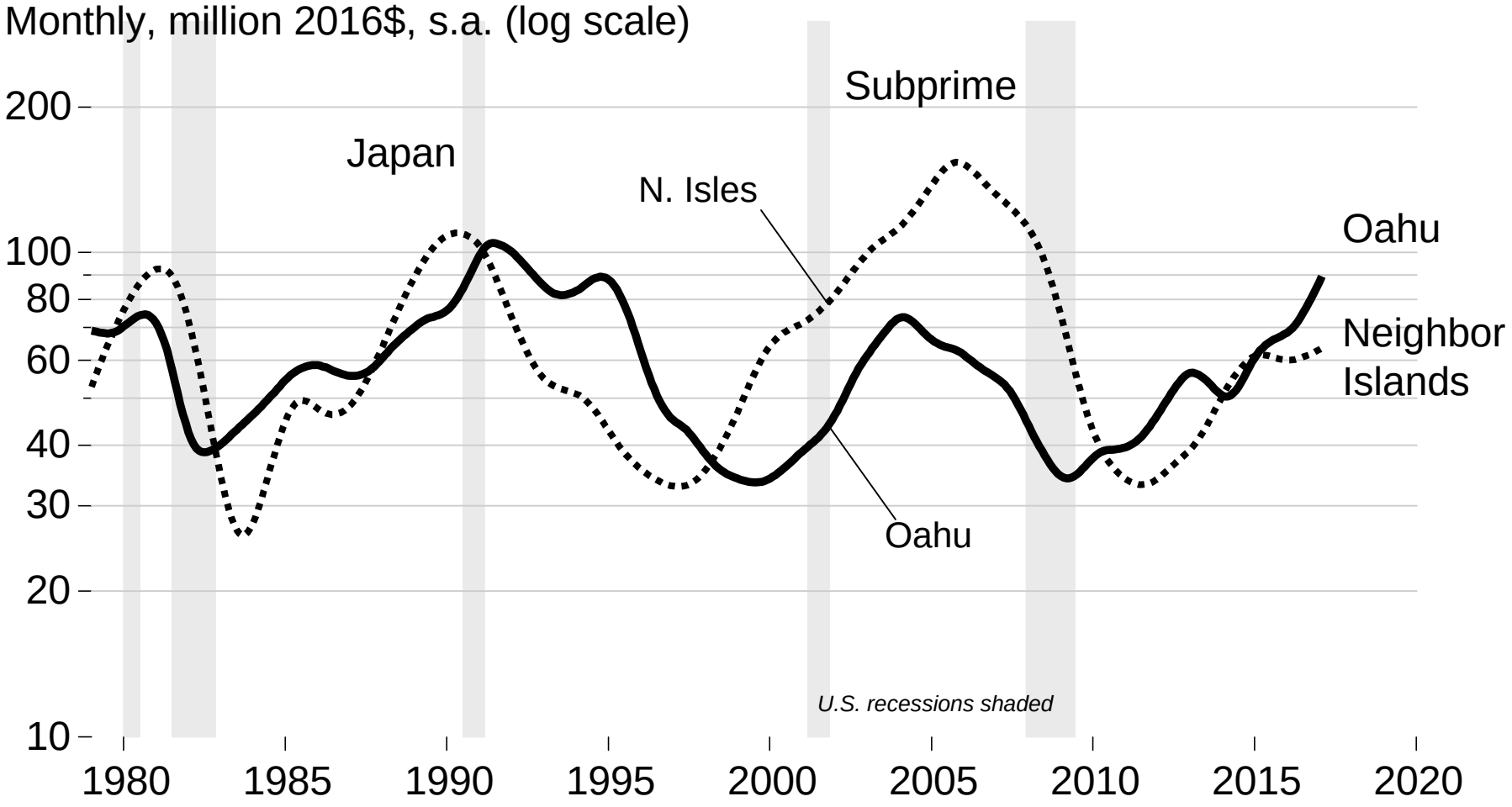
Source: County building departments, Hawaii DBEDT; seasonal adjustment and Hodrick-Prescott filter trend extraction by TZE

Shift in real residential private building consistent with the New Urbanism: agglomeration externalities in services-, information-producing economy



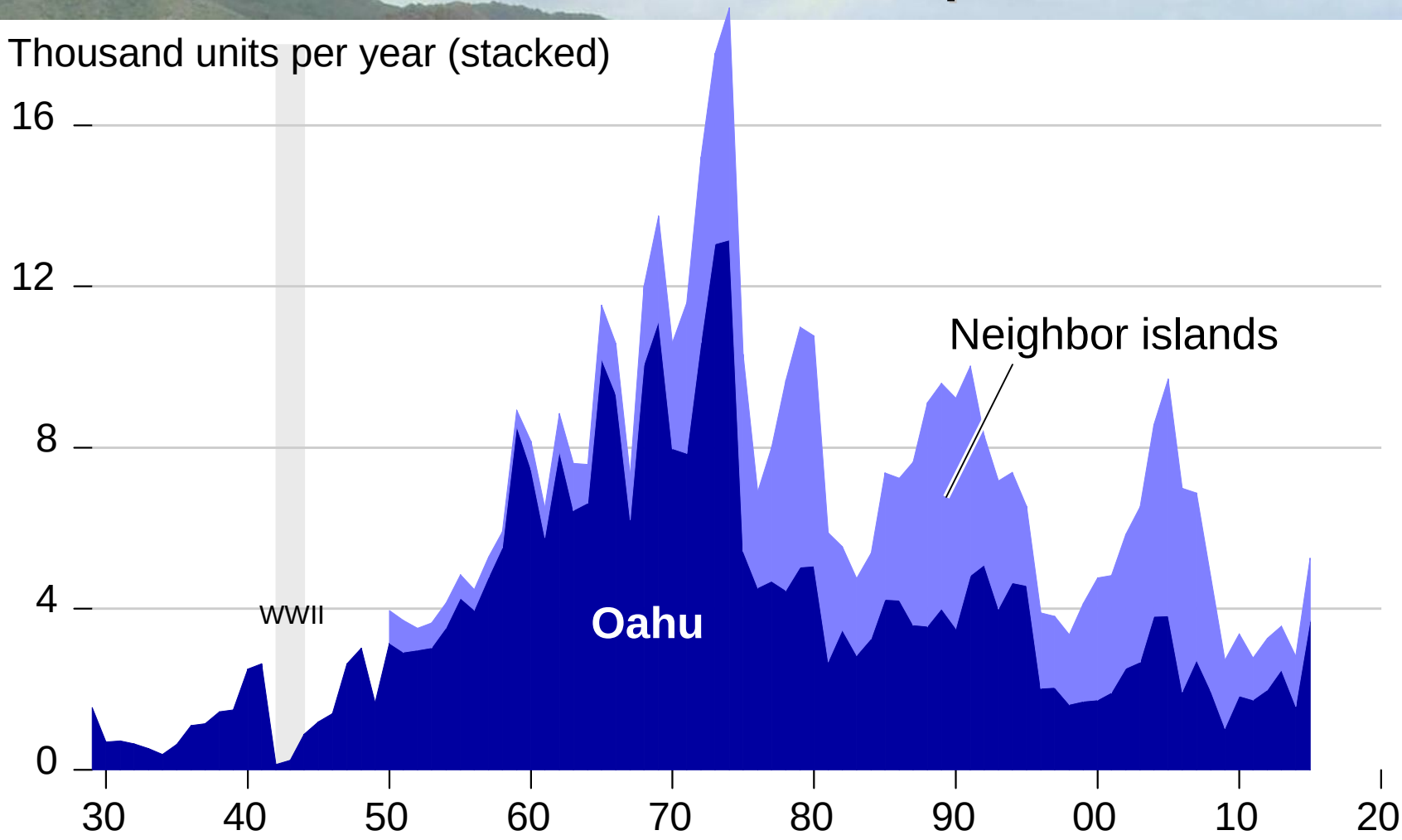
Sources: County Building Departments, seasonal adjustment, deflation using U.S. construction cost implicit price deflator, and cycle-trend component extracted with Hodrick-Prescott filter estimated by TZE; data through February 2017

Shift in real residential private building consistent with the New Urbanism: agglomeration externalities in services-, information-producing economy



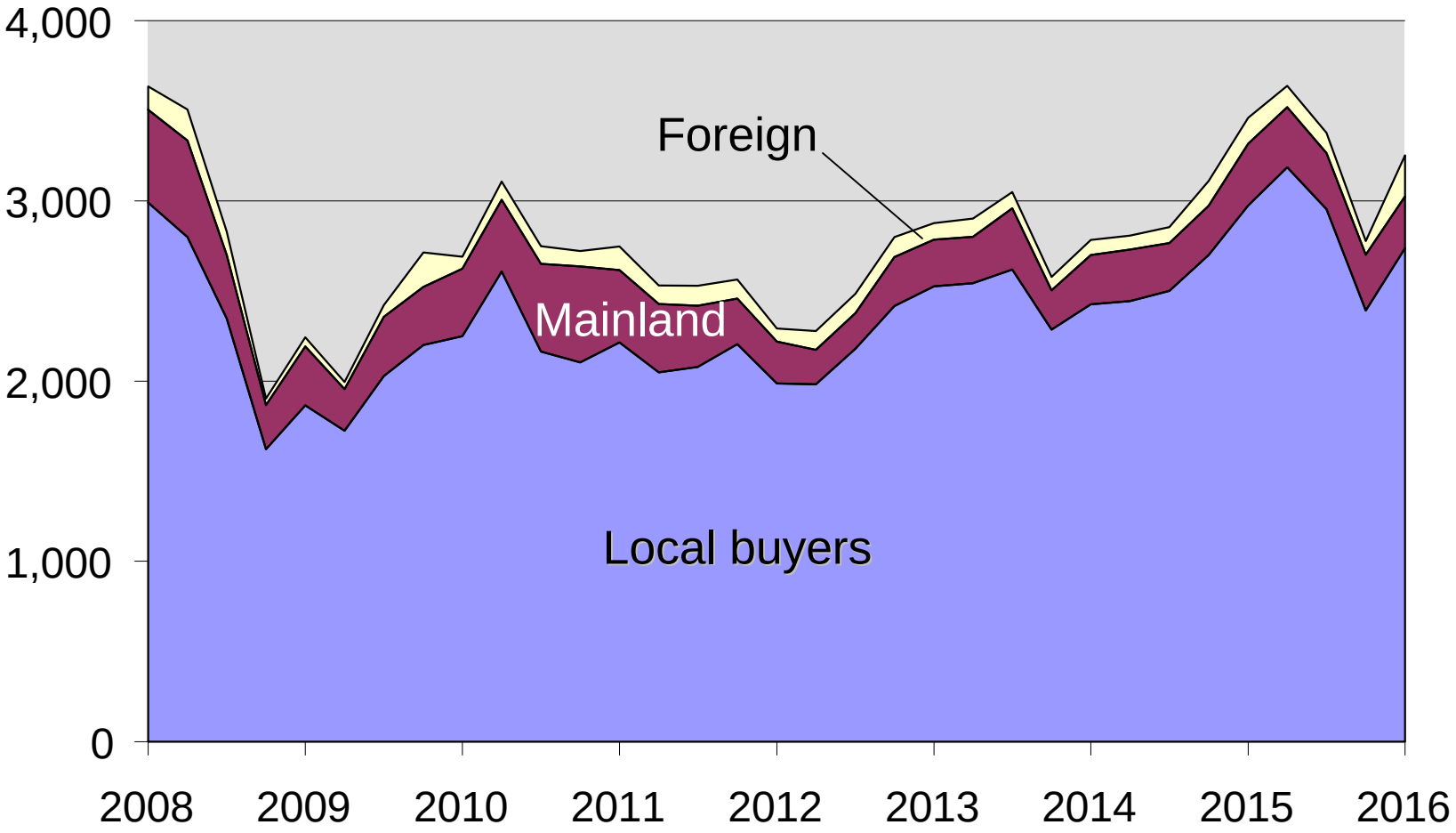
Sources: County Building Departments, seasonal adjustment, deflation using U.S. construction cost implicit price deflator, and cycle-trend component extracted with Hodrick-Prescott filter estimated by TZE; data through February 2017

Longer history: homebuilding flows experienced a structural break after 1974: *de facto* cap at one-third or less production volume



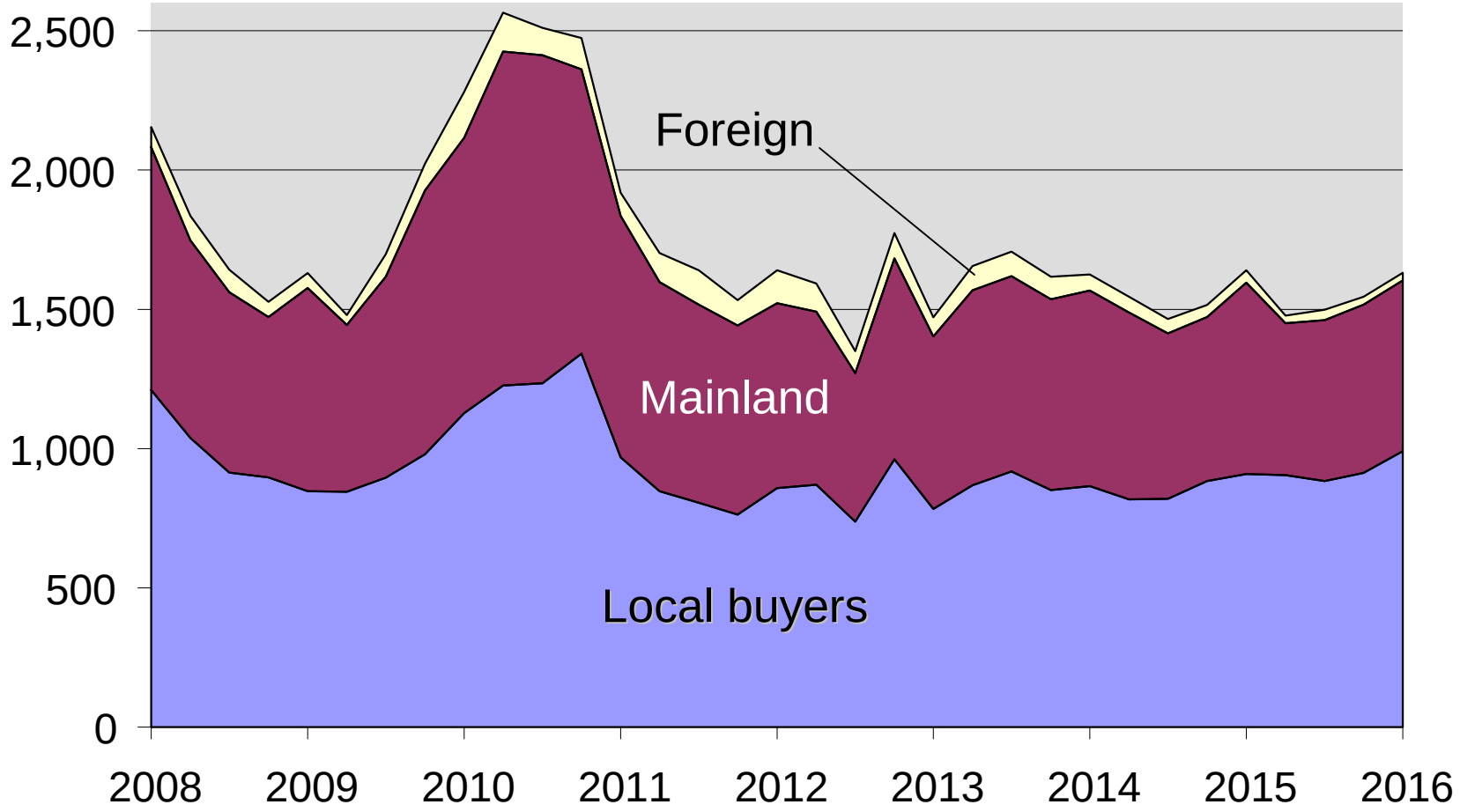
Source: County building departments, Hawaii DBEDT, Robert C. Schmitt *Historical Statistics of Hawaii* (1976) UH Press

Oahu homebuyers are primarily of local origin (87 percent local, 2012-2015)



Sources: Hawaii DBEDT (Title Guaranty compilation of Bureau of Conveyances data); seasonal adjustment by TZE

Neighbor Island homebuyers have shifted from about half offshore to about 40 percent



Sources: Hawaii DBEDT (Title Guaranty compilation of Bureau of Conveyances data); seasonal adjustment by TZE

Some current aspects of housing valuation dynamics on Oahu, Hawaii's main metro area

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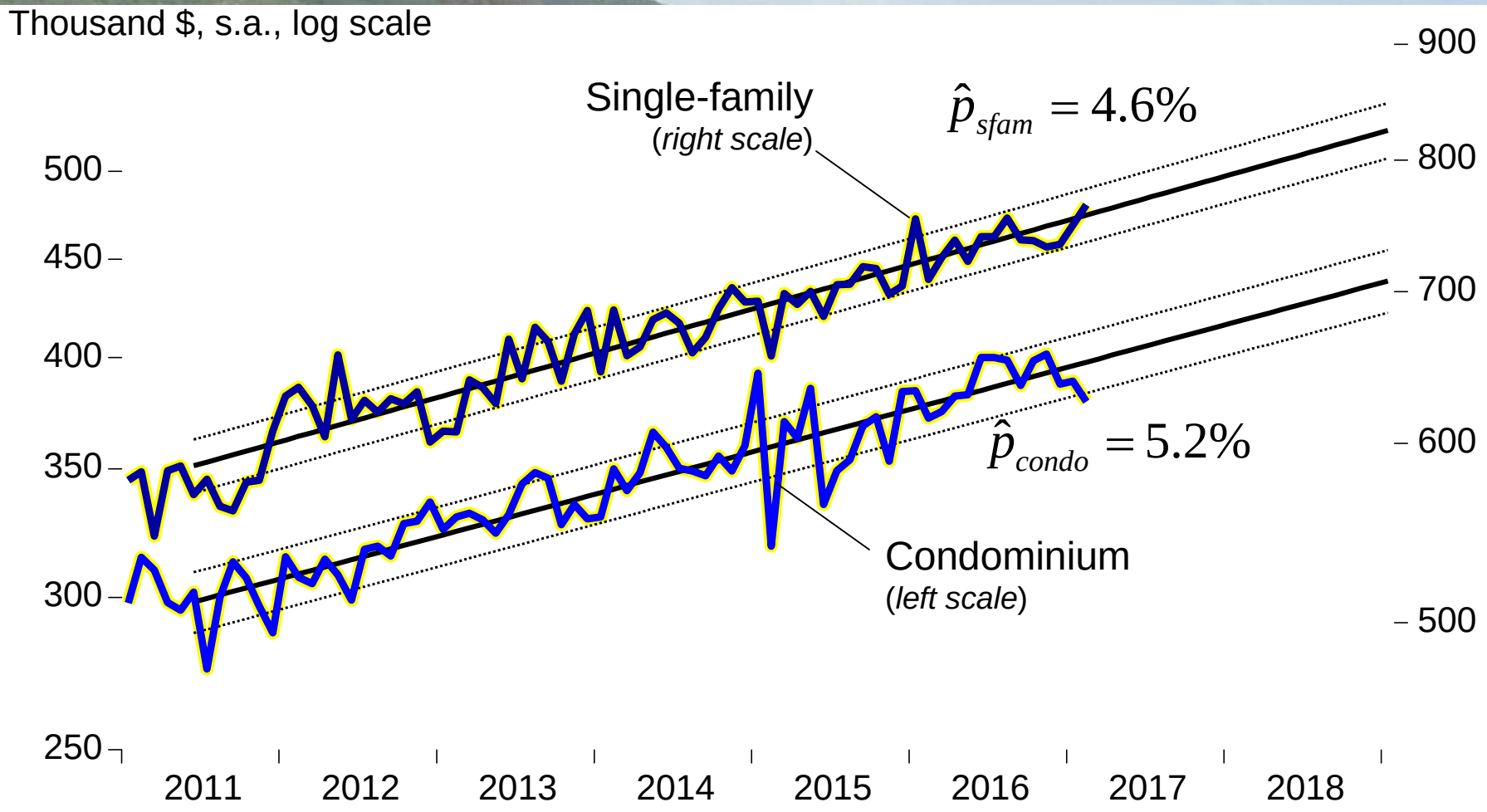
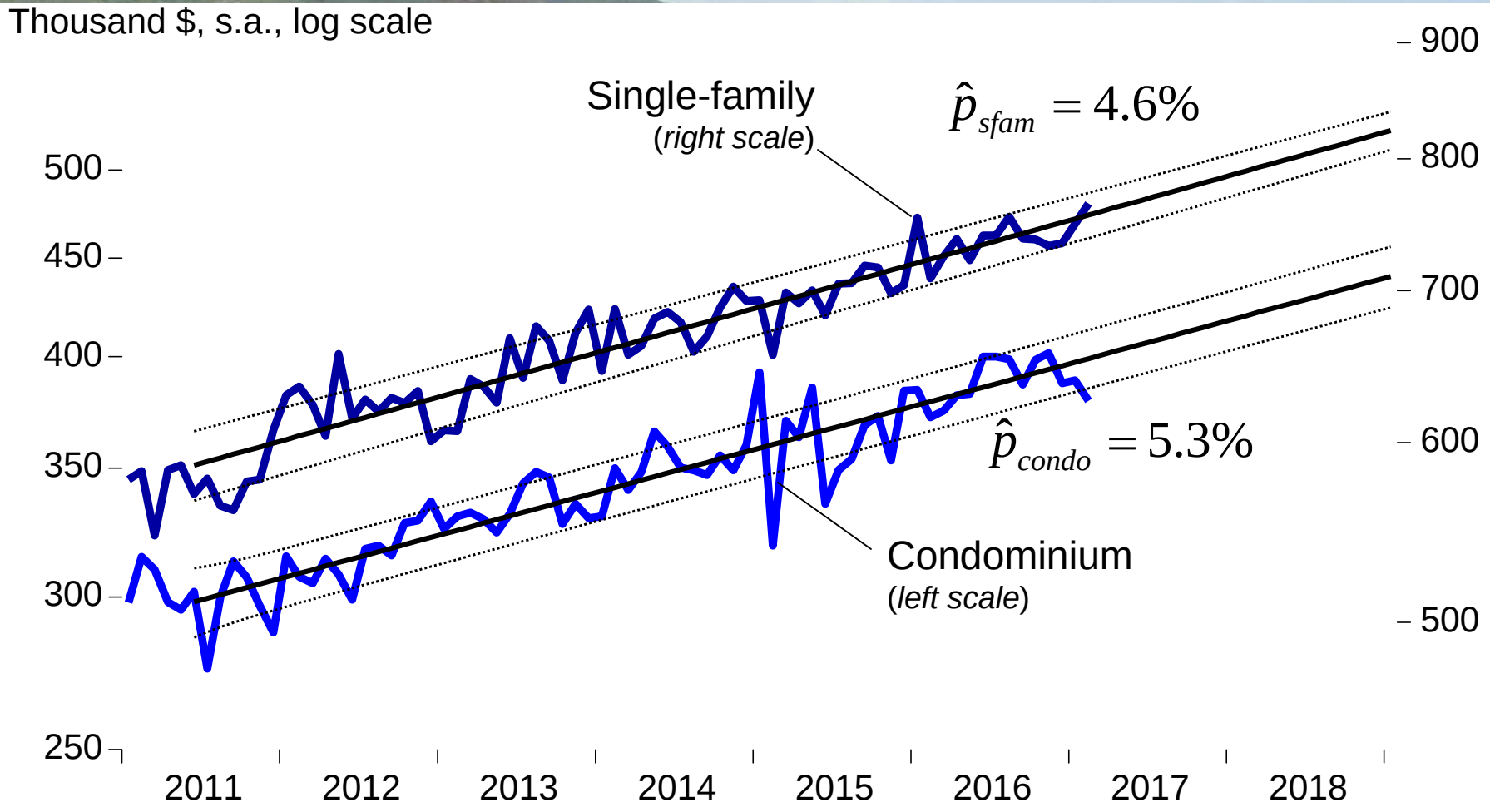
Oahu home valuations on stable path with modest rates of appreciation facing a gradual anticipated interest rate rise



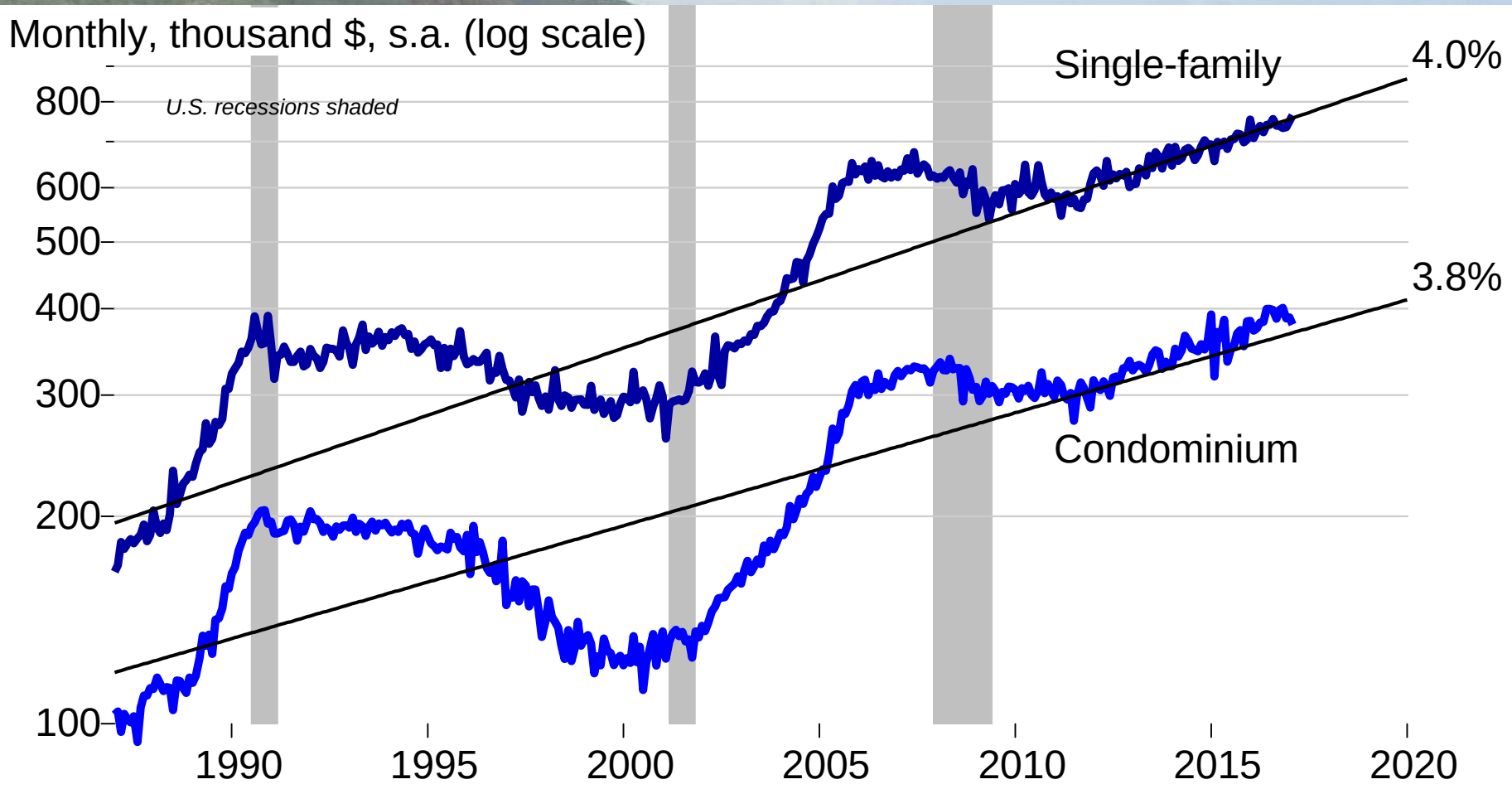
Source: Honolulu Board of Realtors, monthly data; seasonal adjustment and trend regressions June 2011 through February 2017 by TZE, trend estimates assume constant volatility

Oahu home valuations on stable path with modest rates of appreciation facing a gradual anticipated interest rate rise



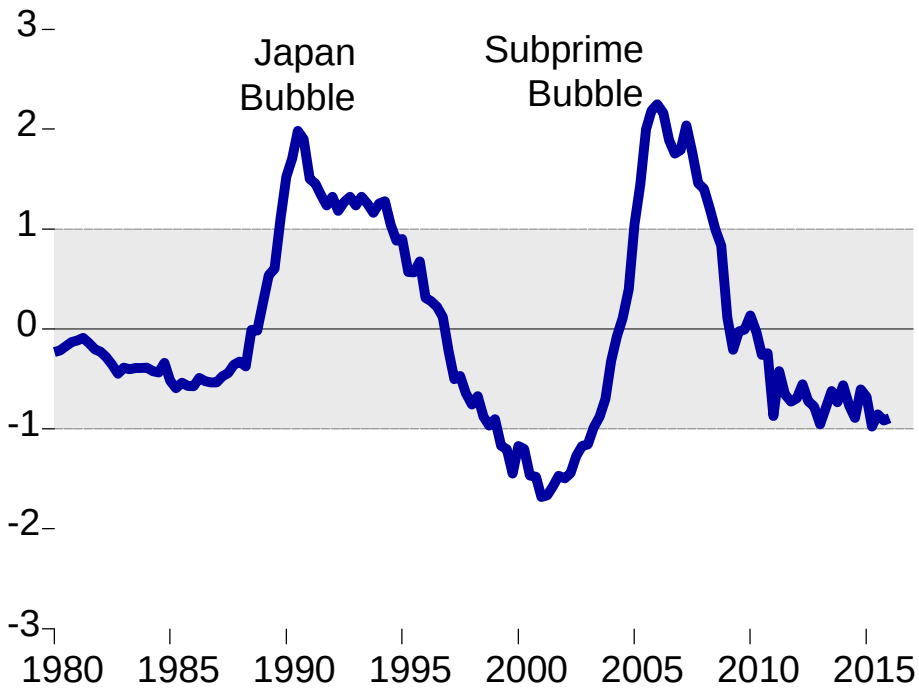
Source: Honolulu Board of Realtors, monthly data; seasonal adjustment and trend regressions June 2011 through February 2017 by TZE, trend estimates take into account time-varying conditional volatility.

Honolulu home price appreciation in 20-teens approximates longer-run appreciation rates

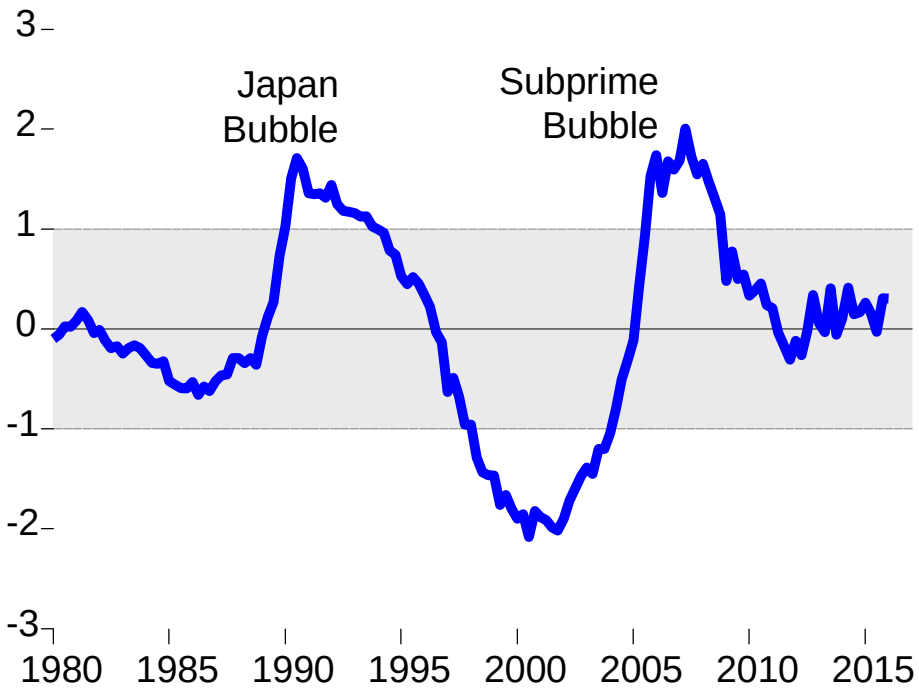


Source: Honolulu Board of Realtors, monthly data; seasonal adjustment and trend regressions January 1987 through February 2017 by TZE

De-trended Oahu median existing single-family home and condominium prices: bubbles ï 2 standard errors around trend



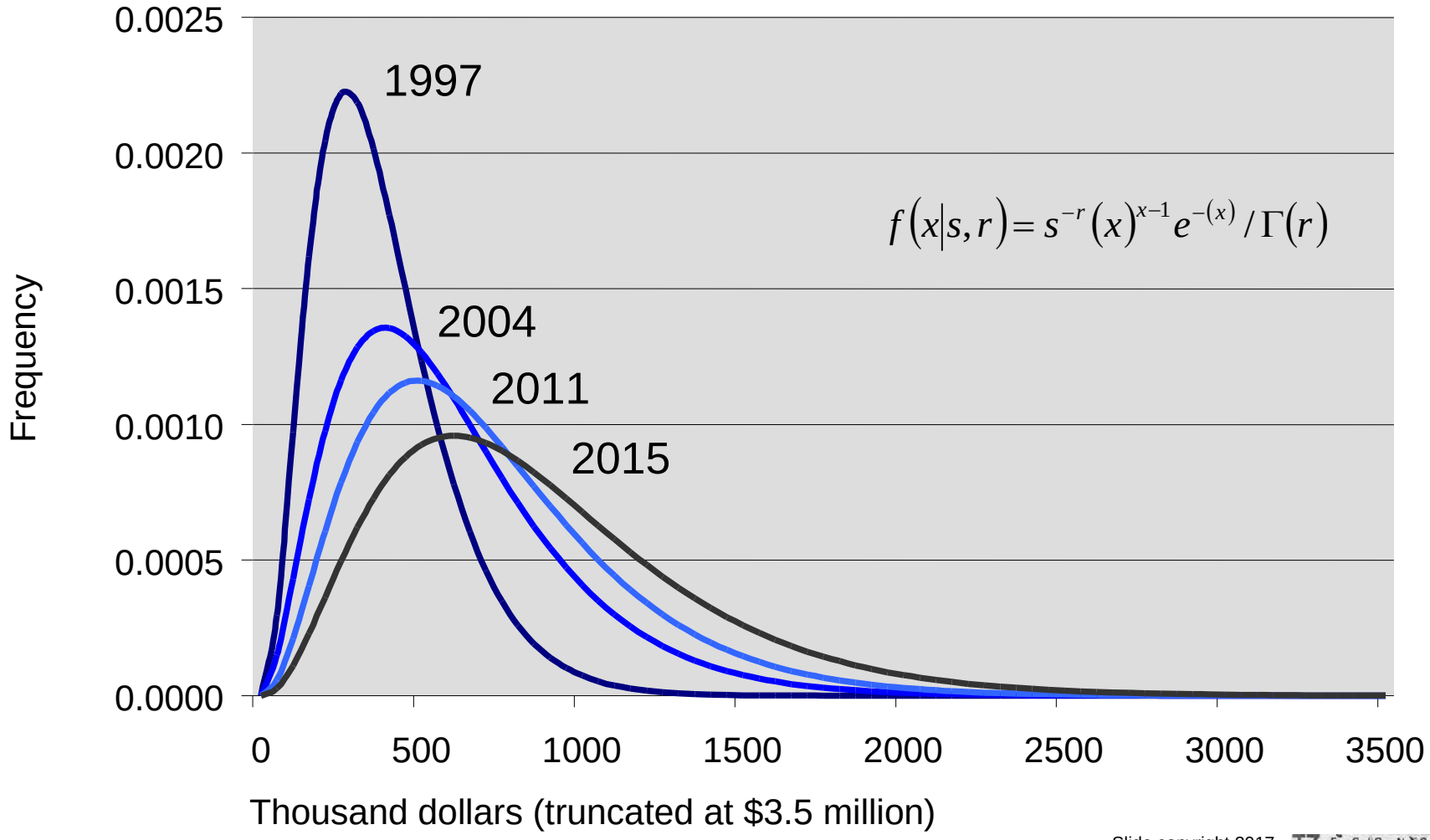
Oahu single-family homes



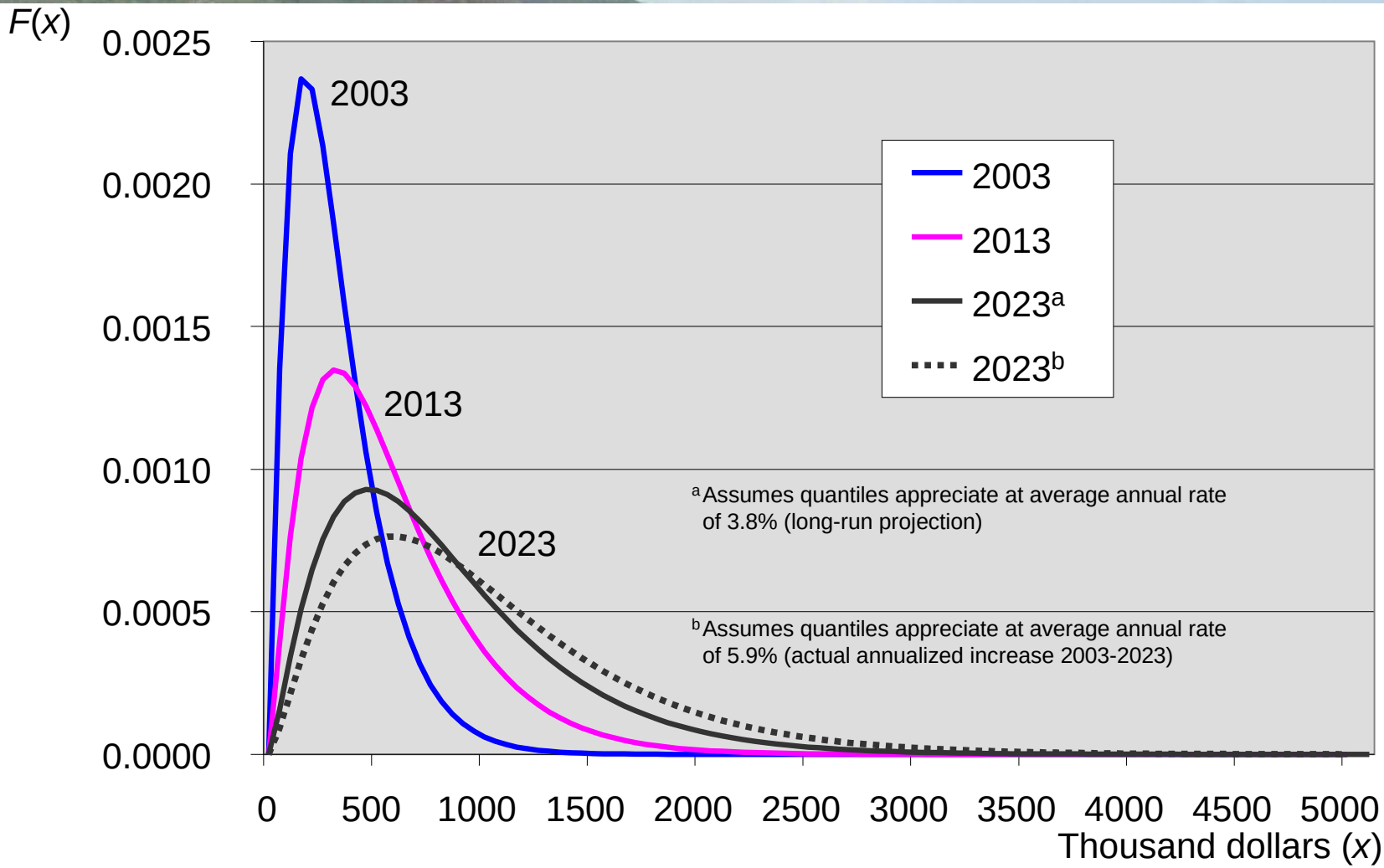
Oahu condominiums

Source for underlying data: Prudential Locations, UHERO, National Association of Realtors; seasonal adjustment and normalization by TZE

Estimated gamma distributions for Oahu existing single-family home sales prices in the "trend cross-over" years



Estimated gamma distributions of Oahu existing home sales prices (2003, 2013, projected 2023); (single-family homes only)



Source for underlying data: Honolulu Board of Realtors; gamma distributions estimated by TZE

Quantile thresholds from the inverse gamma distribution of Oahu home prices; (single-family homes)

	Year			
million $ thresholds	**2003**	**2013**	**2023[a]***	**2023[b] †**
Top 0.01%	1.767	3.055	4.380	5.282
Top 0.1%	1.394	2.418	3.474	4.195
Top 1.0%	1.008	1.759	2.536	3.069
Top 5%	0.726	1.275	1.845	2.239
Top 10%	0.598	1.055	1.531	1.861
Top 20%	0.464	0.823	1.199	1.460
Top 30%	0.380	0.678	0.991	1.209
Top 40%	0.317	0.569	0.833	1.019
Top 50%‡	0.265	0.477	0.702	0.860
Actual median ($)	239,000	449,500	-	-
Actual mean ($)	312,302	559,917	-	-
Mean from log distn ($)	242,567	439,480	-	-

*Quantiles appreciate at (unweighted) average annual rate of 3.8% (2013-2023)

†Quantiles appreciate at (unweighted) average annual rate of 5.9% (2013-2023)

‡Median price from *synthetic* (empirical gamma) distribution

Source for underlying data: Honolulu Board of Realtors; cumulative distributions estimated by TZE

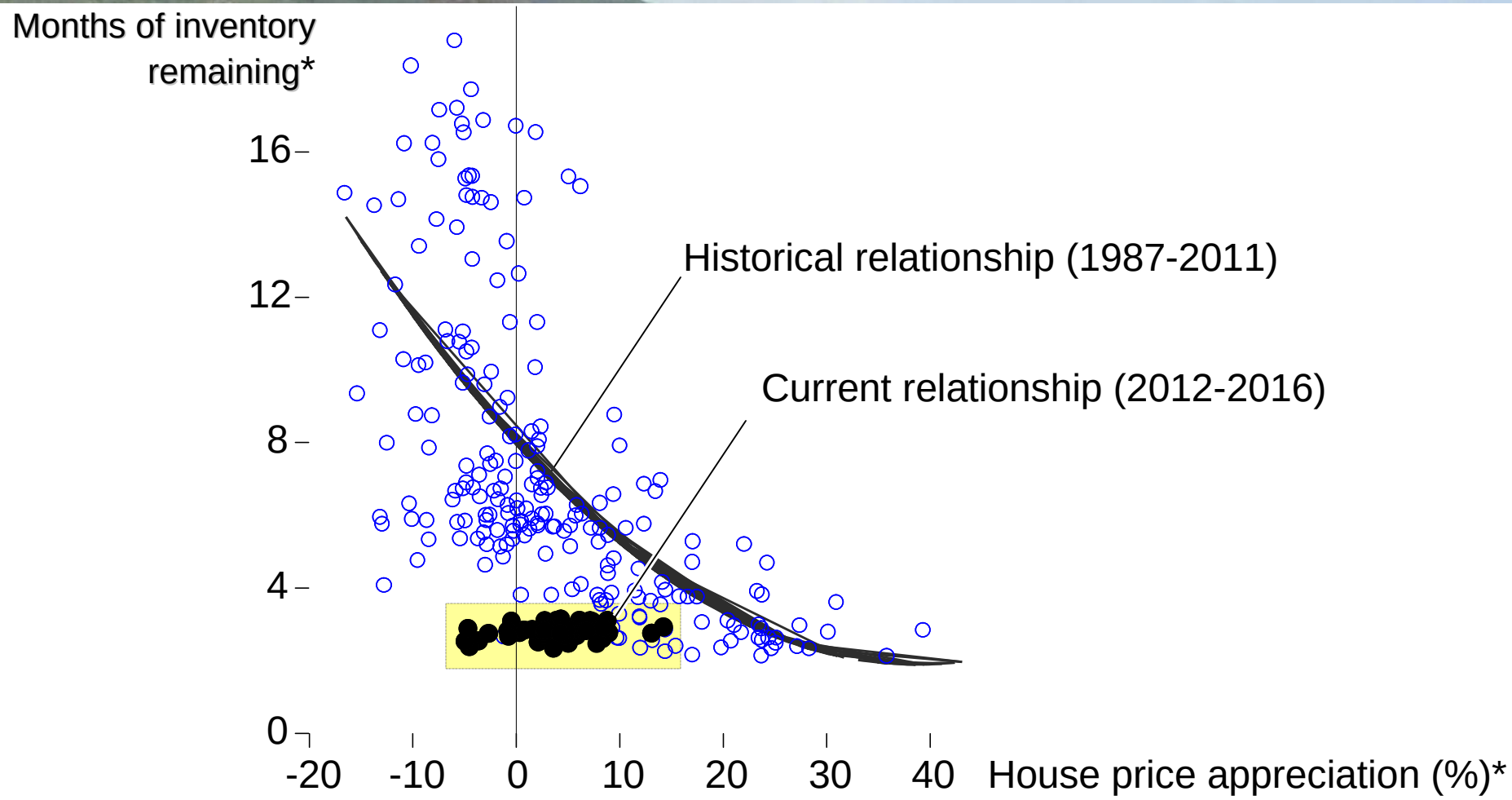
Honolulu's effective residential property tax rates remain among the lowest nationwide

Effective tax rates in the largest cities in the 50 states and D.C.

		Rate/$100			Rate/$100
1	Detroit, MI	3.44	42	Virginia Beach, VA	0.880
2	Milwaukee, WI	3.00	43	Seattle, WA	0.870
3	Bridgeport, CT	2.95	44	Washington, DC	0.850
4	Indianapolis, IN	2.92	45	Charleston, WV	0.820
5	Newark, NJ	2.74	46	Birmingham, AL	0.700
6	Des Moines, IA	2.62	47	Denver, CO	0.690
7	Houston, TX	2.57	48	Cheyenne, WY	0.680
8	Manchester, NH	2.27	49	Chicago, IL	0.680
9	Columbus, OH	2.20	**50**	**Honolulu, HI**	**0.350**
10	Burlington, VT	2.14	51	Jackson, MS	0.020
	Unweighted average	1.56		Median	1.400

Source: Government of the District of Columbia (December 2015), *Tax Rates and Tax Burdens in the District of Columbia: A Nationwide Comparison*, 2014, Table 4 (http://cfo.dc.gov/sites/default/files/dc/sites/ocfo/publication/attachments/2014%2051City%20Study.final_.pdf)

Breakdown of Oahu "Sklarz Curve"—historical inverse relationship between remaining inventory and price appreciation



*Oahu single-family homes

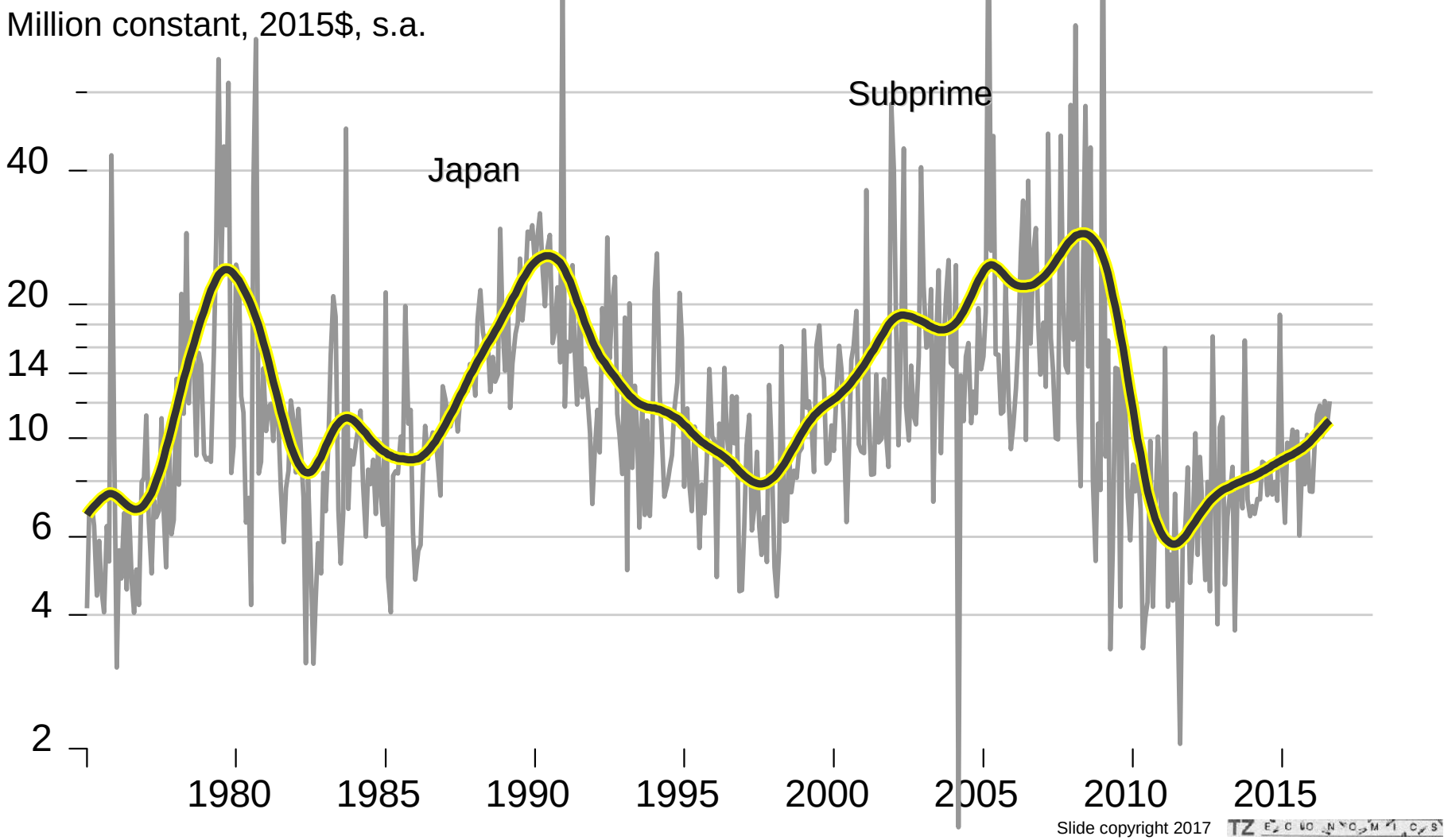
Source: Honolulu Board of Realtors, monthly data; seasonal adjustment by TZE

Kauai's housing market case study

- Demand side of market
  1. Strong absorption as buyers flock to affordable, low-end units
  2. Supported by favorable mortgage rates, subject to future headwinds
  3. Underlying economic fundamentals for Kauai modestly improved

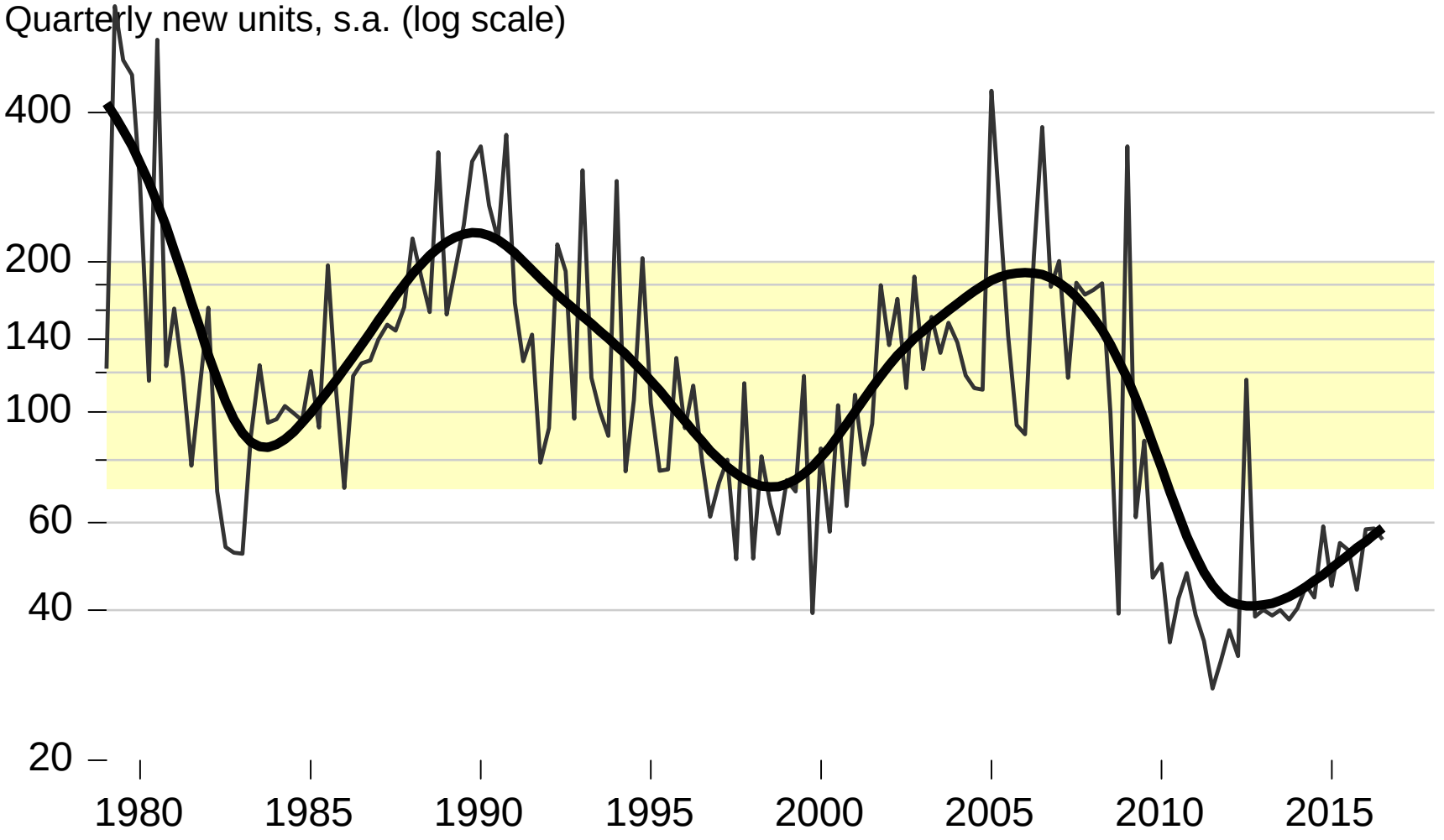
- Supply side
  1. Inventory statistics suggest market balanced but "taught"
  2. New authorizations by building permit at historic lows
  3. Incremental housing stock growth *less* than population growth rate

Kauai monthly real private residential building permits: very slow recovery, with a more recent quickening of commitments



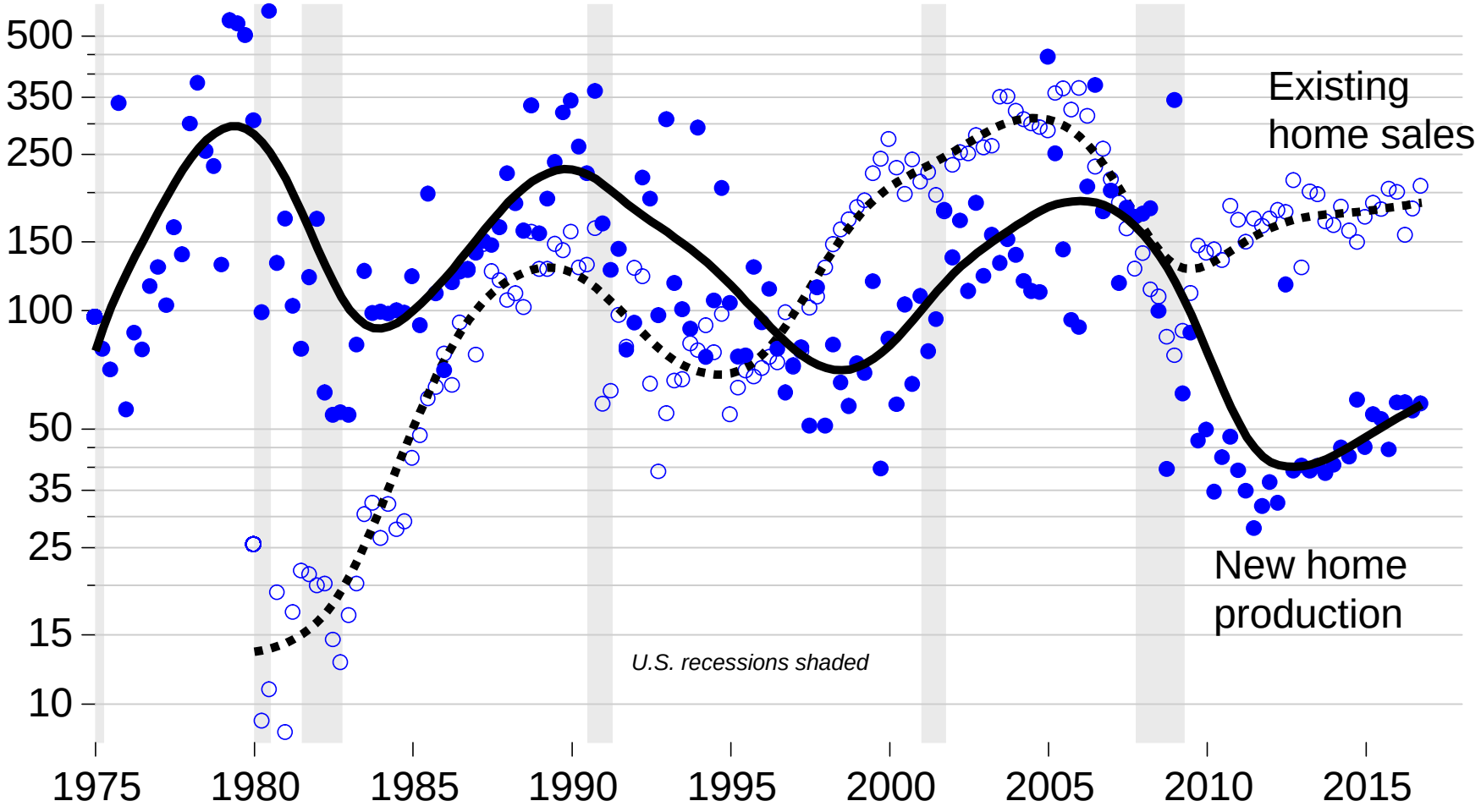
Sources: County Building Department, Hawaii DBEDT, Bureau of the Census; seasonal adjustment, trend and deflation calculations by TZE

Kauai new housing units authorized by building permit—good news and bad news: rising; as good as worst prior cyclical low



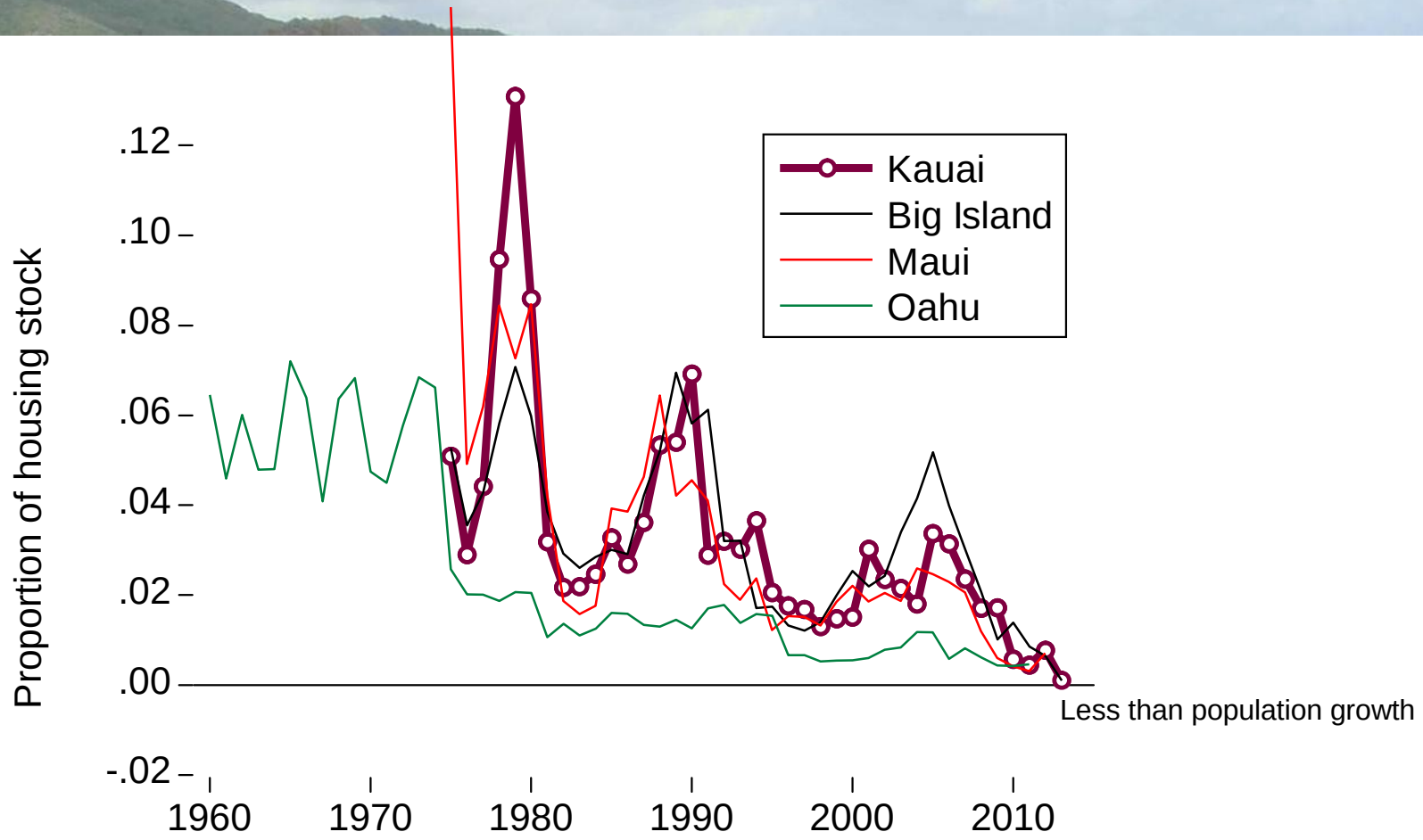
Source: Kauai County, DBEDT; seasonal adjustment calculations for Kauai by TZE, data through third quarter 2016

Kauai quarterly existing home sales (velocity) outstrip new homes authorized by building permit (production intention); unit counts



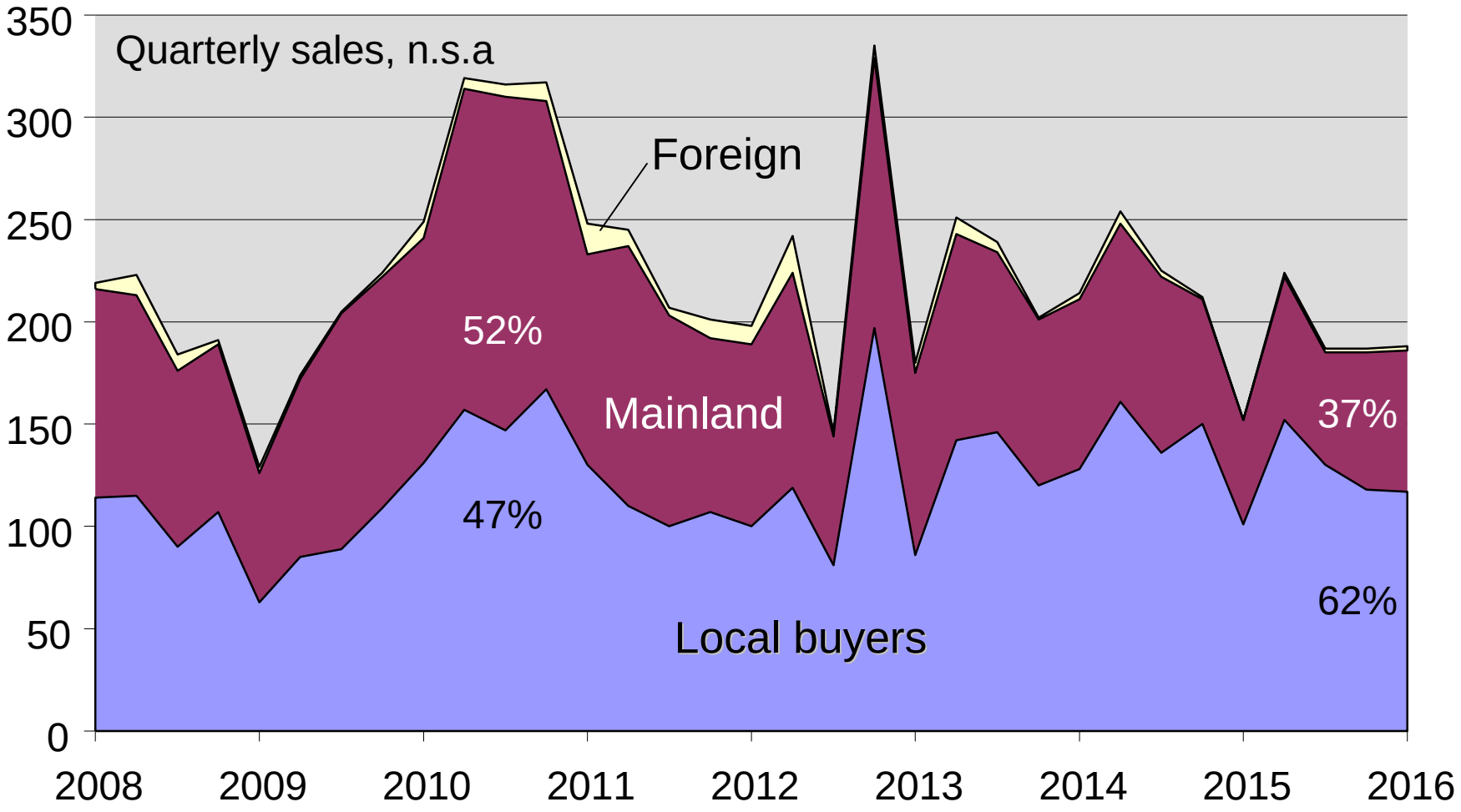
Source: Data through 2016Q4 from Hawaii Information Service and Kauai Board of Realtors, County Building Department, Hawaii DBEDT, TZE database; seasonal adjustment and trend/cycle extraction by TZE

Incremental capital ratios for housing: new units (building permits) as % of (prior year) housing stock



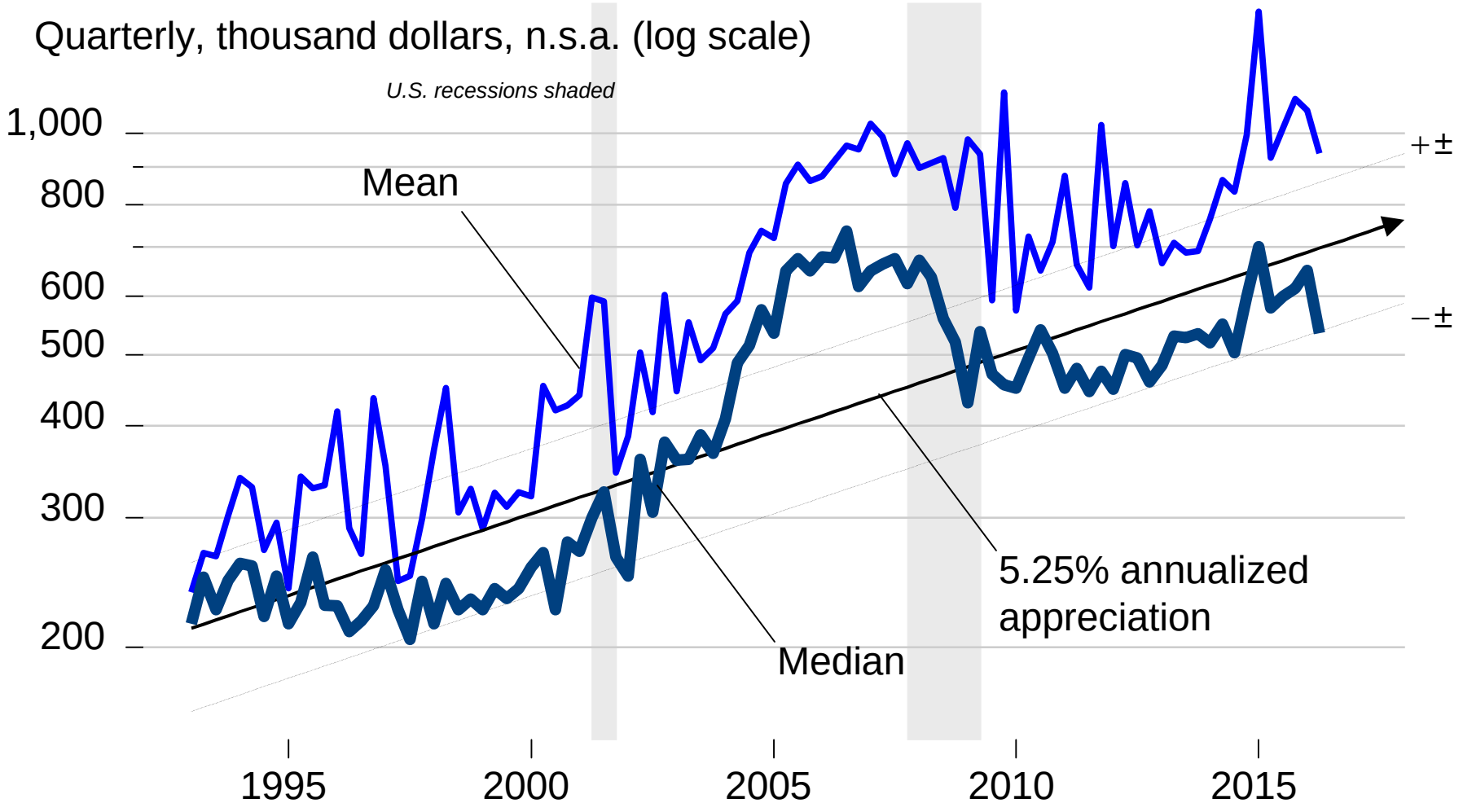
Source: Bureau of the Census, U.S. Department of the Census, Hawaii DBEDT, Kauai Building Department, TZE database

Mix of Kauai homebuyers has shifted from more than one-half offshore to about 40 percent since post-recession "fire sale"



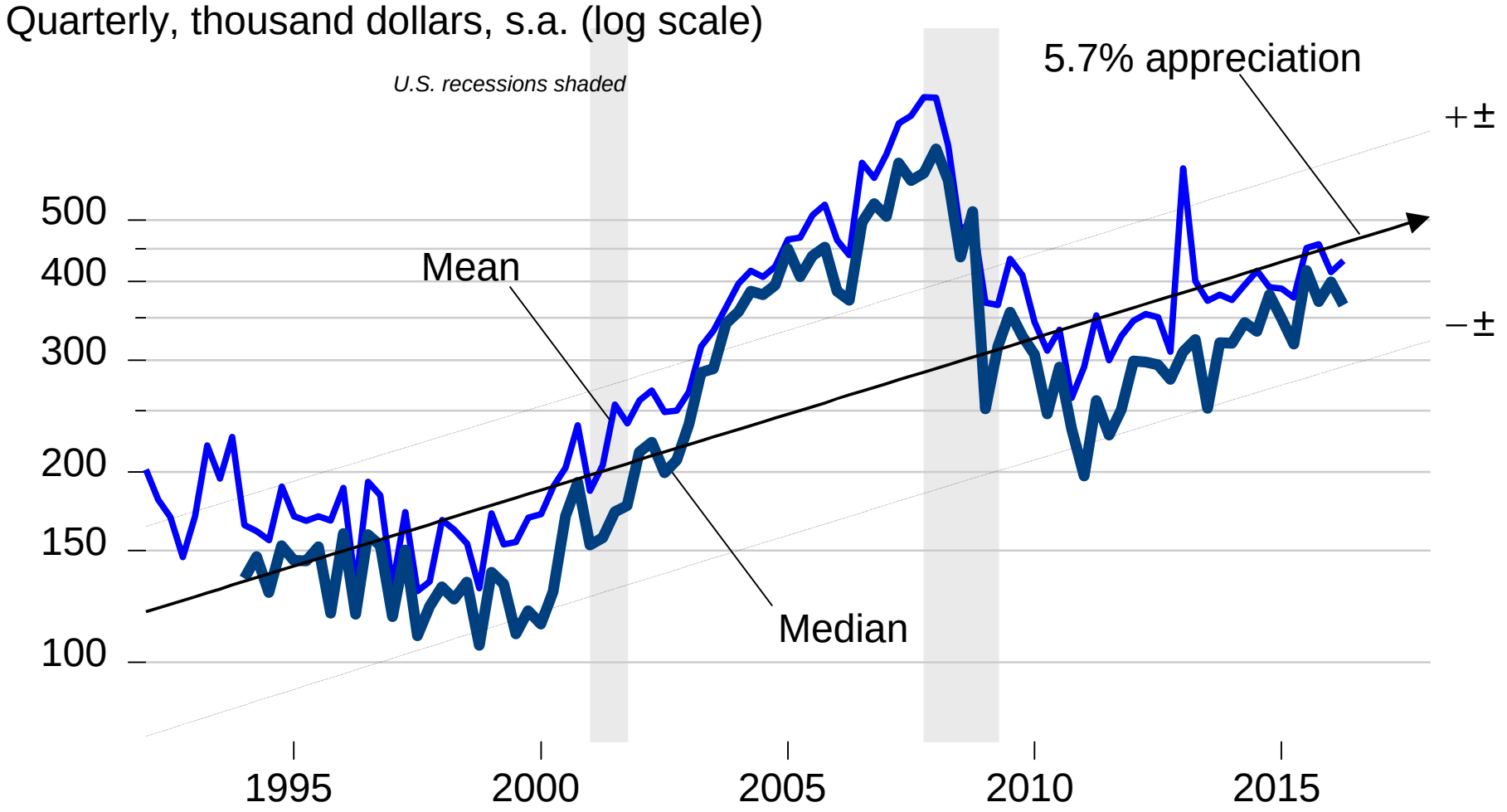
Sources: Hawaii DBEDT (Title Guaranty compilation of Bureau of Conveyances data); seasonal adjustment by TZE

At quarterly frequencies, Kauai single-family existing home sale prices exhibit long-run trend convergence to 5% appreciation



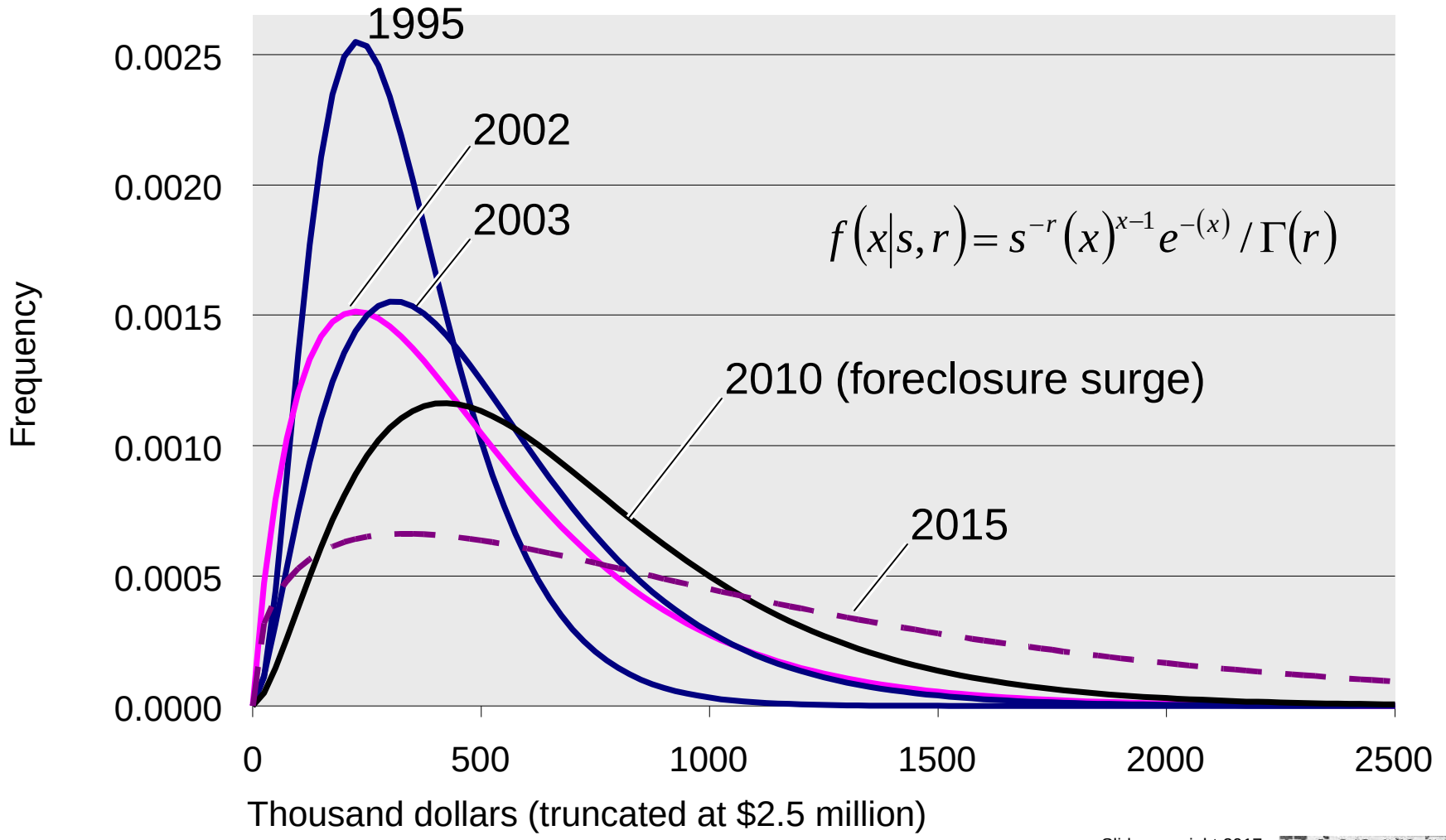
Source: Hawaii Information Service; trend regressions by TZE

At quarterly frequencies, Kauai condominium sale price long-run appreciation rate may be biased upward by bubbliciousness



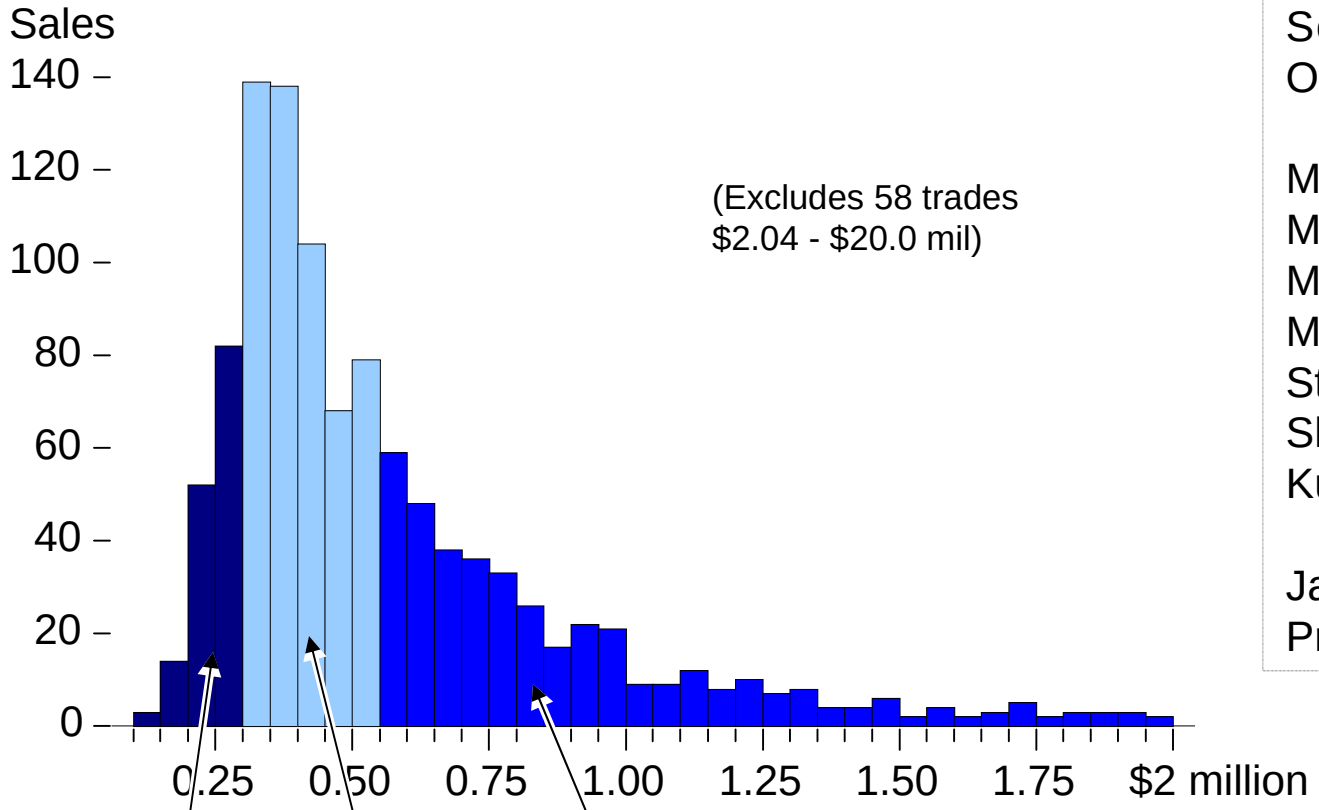
Source: Hawaii Information Service; seasonal adjustment and trend regressions by TZE

Kauai single-family home price empirical gamma distributions (along trend) exhibit increasing skewness in 20-teens transactions prices



Source: Hawaii Information Service; empirical distribution estimates by TZE

Problem with 25% affordable housing quotas (Kauai SF home price distribution 2010-12): middle cannot cross-subsidize low-end



(Excludes 58 trades
$2.04 - $20.0 mil)

Series: SF <$2mil
Observations 1085

Mean	0.562499
Median	0.450000
Maximum	1.950000
Minimum	0.120000
Std. Dev.	0.328491
Skewness	1.746896
Kurtosis	6.286656
Jarque-Bera	1040.185
Probability	0.000000

If one of these is required... ...for three of these to be built...

...FEW of these *ever* will be built

Shaded dark blue (lower four quantiles): at a 4-person family income of $86,500 about $300,000 in house can be acquired*

*Estimate from Zillow.com (July 18, 2013) assuming a $50,000 down payment, 36% debt/income ratio, 680-600 FICO score, property tax rate of 0.575%/year, homeowner insurance premium of $1,500/year, $1,000 in other monthly debts, giving a $1,600 monthly mortgage payment @ 4.284%

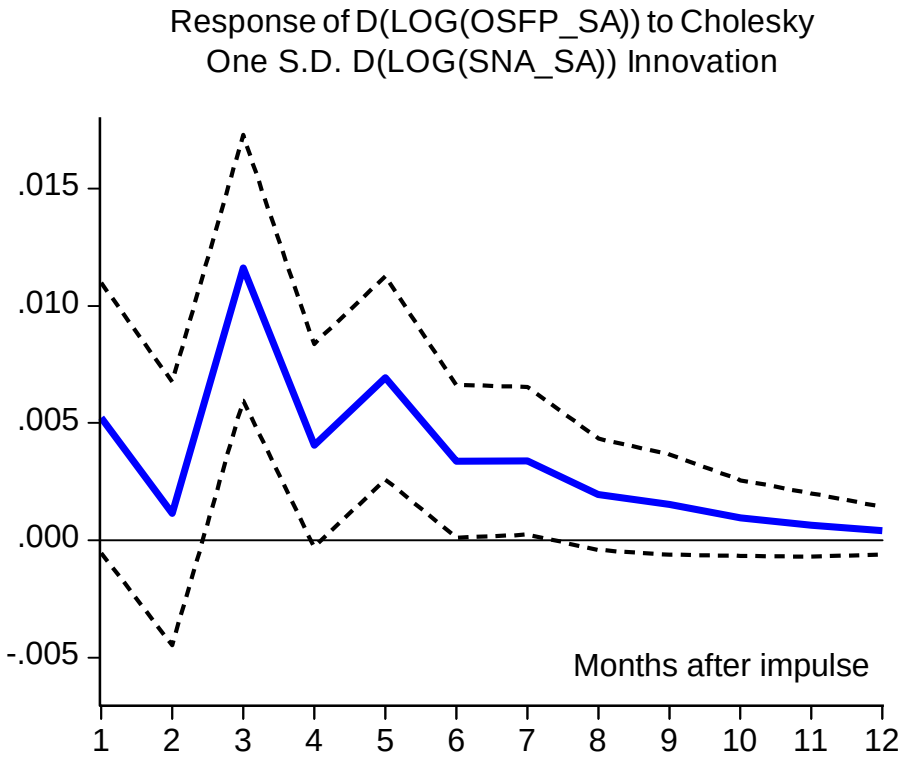
Single-family home price cross-correlations 2008-2013: a high degree of co-movement (range is −1 to +1; these are all > 0.9)

	SFO	SNA	OGG	LIH	KOA
SFO	1	0.963	0.910	0.902	0.929
SNA	0.963	1	0.955	0.946	0.952
OGG	0.910	0.955	1	0.966	0.982
LIH	0.902	0.946	0.966	1	0.971
KOA	0.929	0.952	0.982	0.971	1

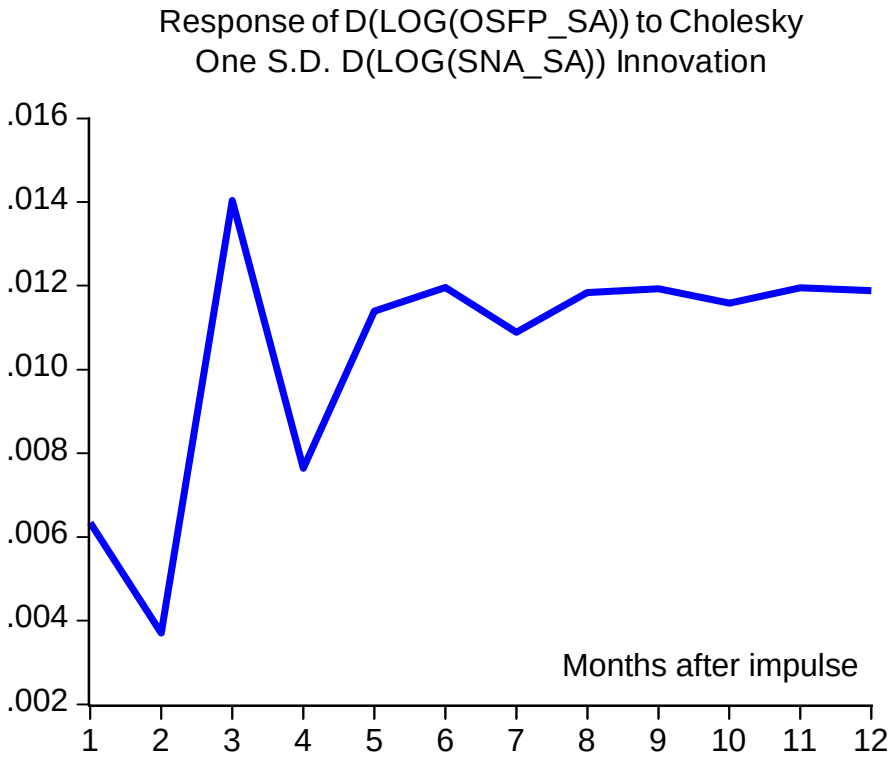
Where:

SFO	San Francisco, Oakland, Fremont
SNA	Anaheim, Santa Ana, Irvine
OGG	Maui
LIH	Kauai
KOA	Hawaii Island TMK 5-8 (Kona Side)

Vector autoregression impulse responses: lag between Oahu and California price changes



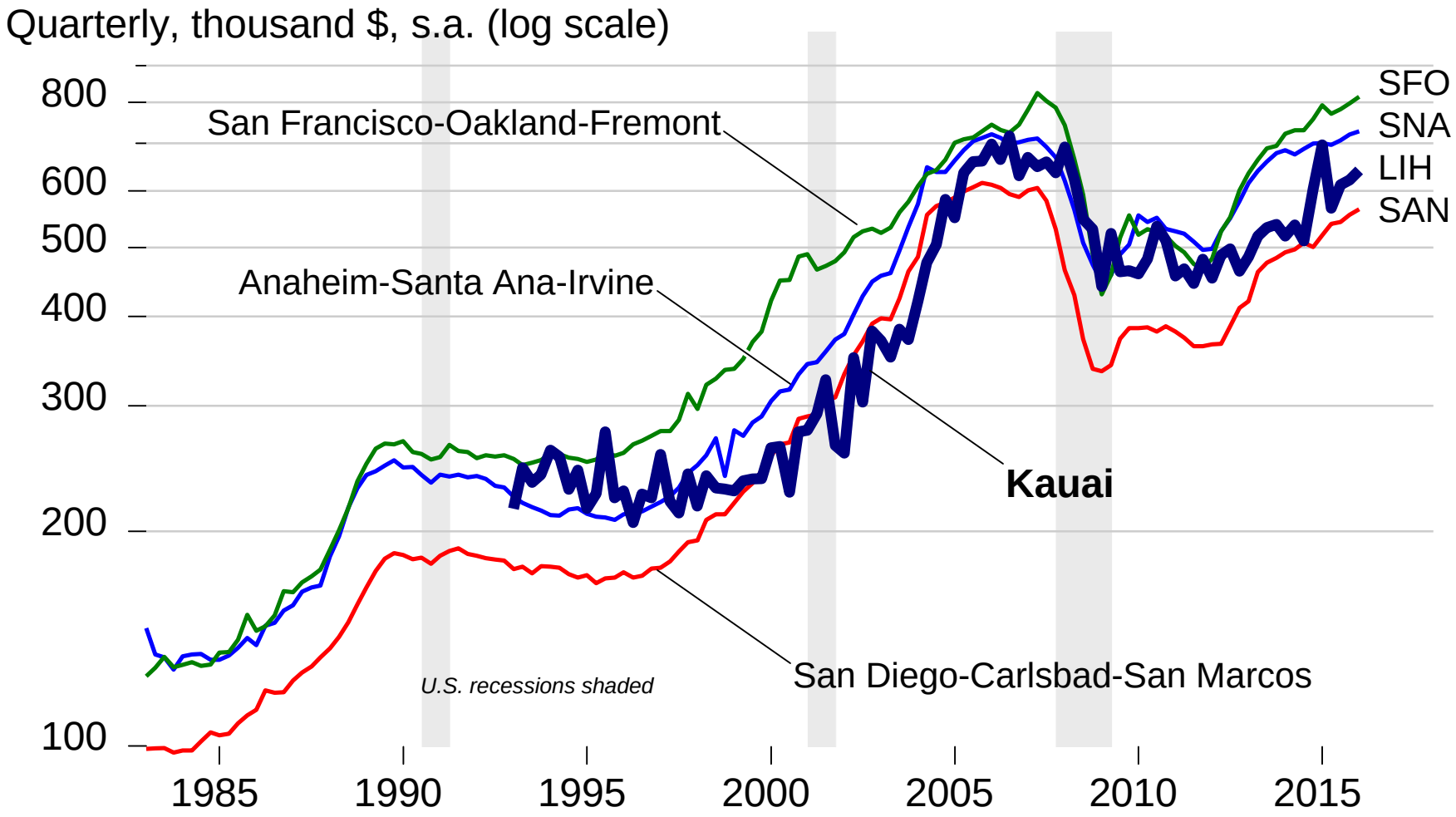
Vector autoregression model (VAR)
Orange County, CA → Honolulu County, HI



Vector error-correction model (VEC)
Orange County, CA → Honolulu County, HI

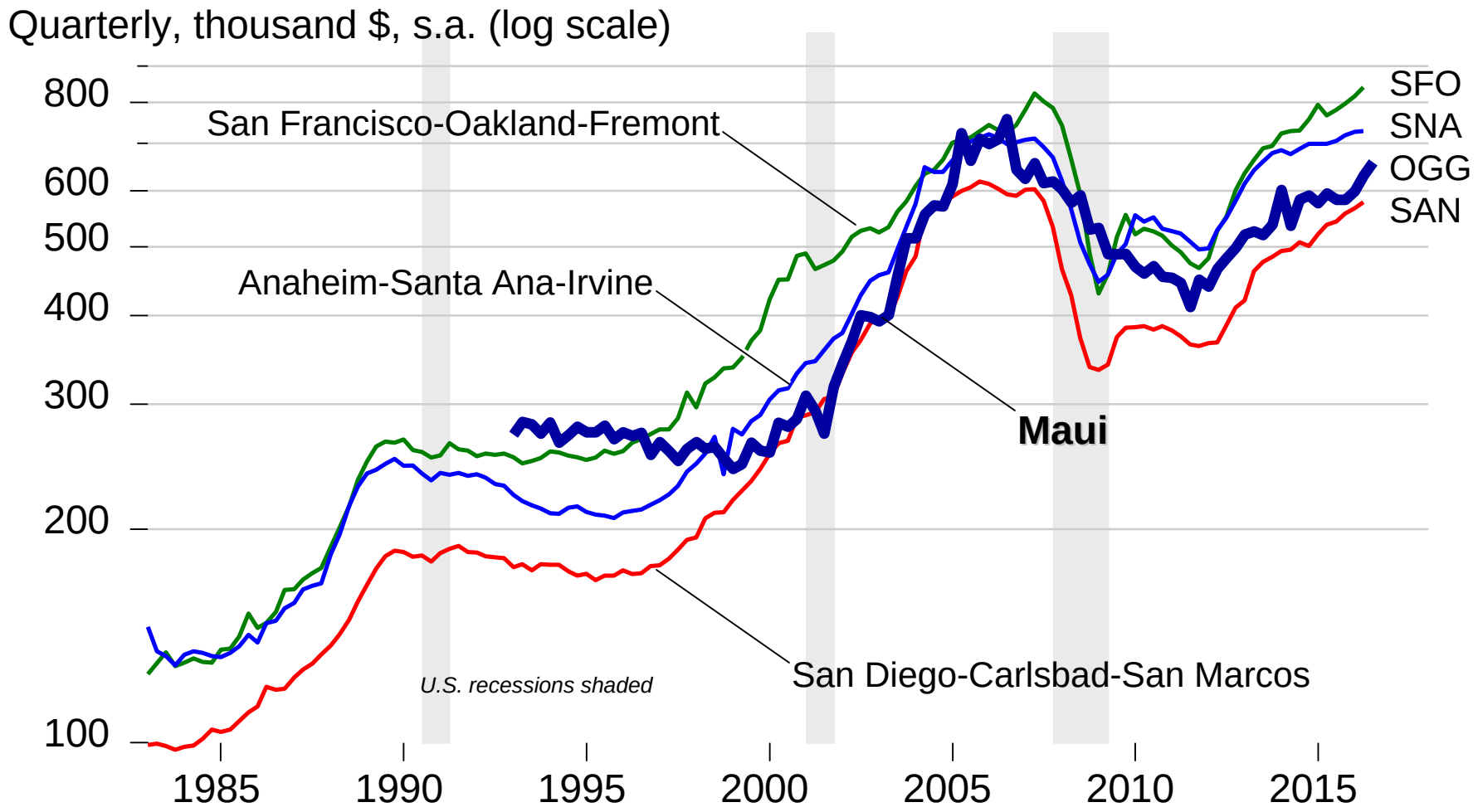
Regressions from 1980.1 through 2011.3; data sources: National Association of Realtors, Honolulu Board of Realtors, Prudential Locations, Inc.; data seasonally-adjusted by TZE using Census X-12 ARIMA filter

Kauai single-family median existing home prices also "arbing" plausibly to California; time suggestive of long-run convergence



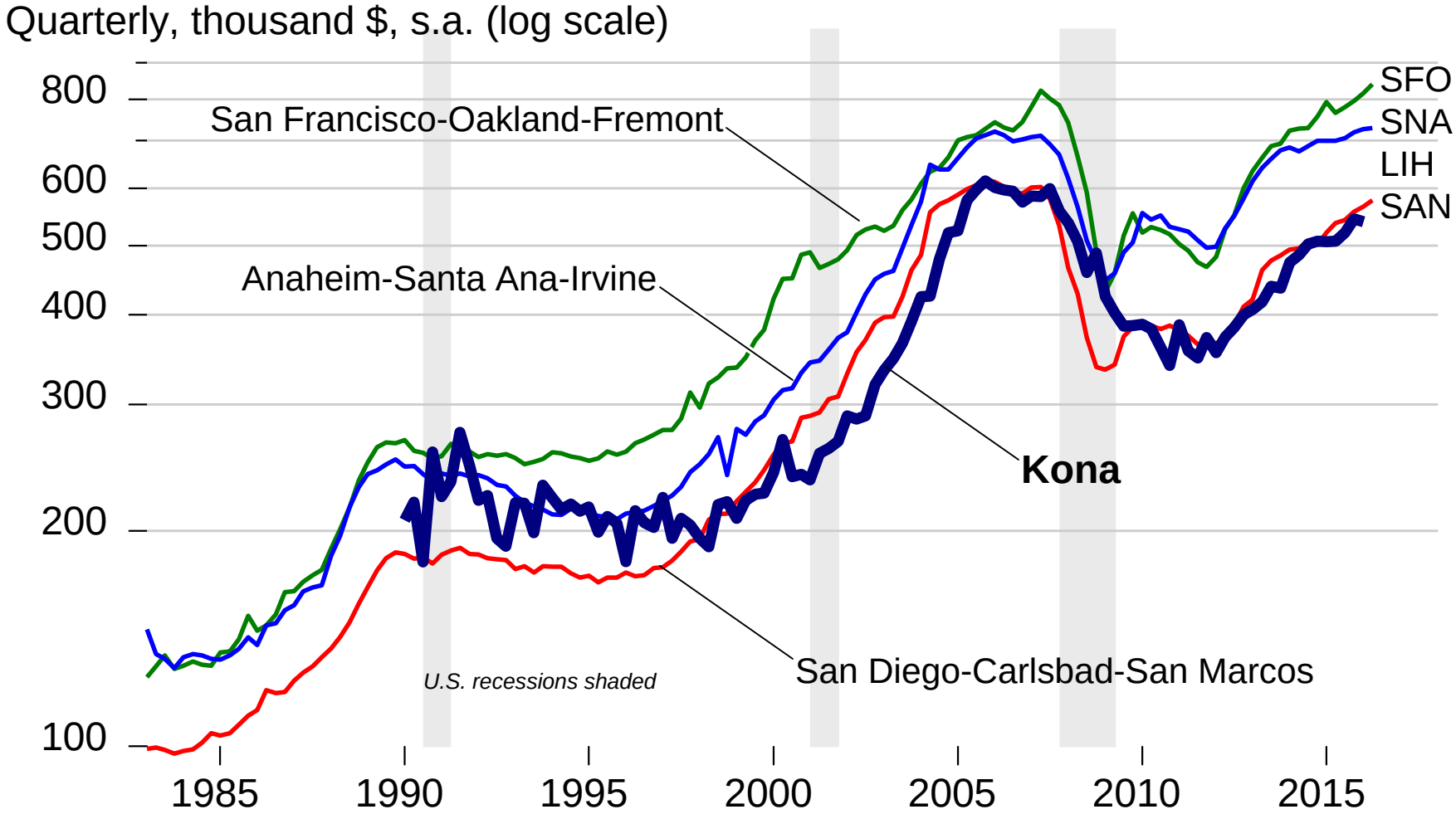
Sources: Hawaii Information Service, National Association of Realtors; seasonal adjustment by TZE

Maui single-family median existing home prices had slipped behind the No-CAL rally, but surged back during 3rd quarter 2016



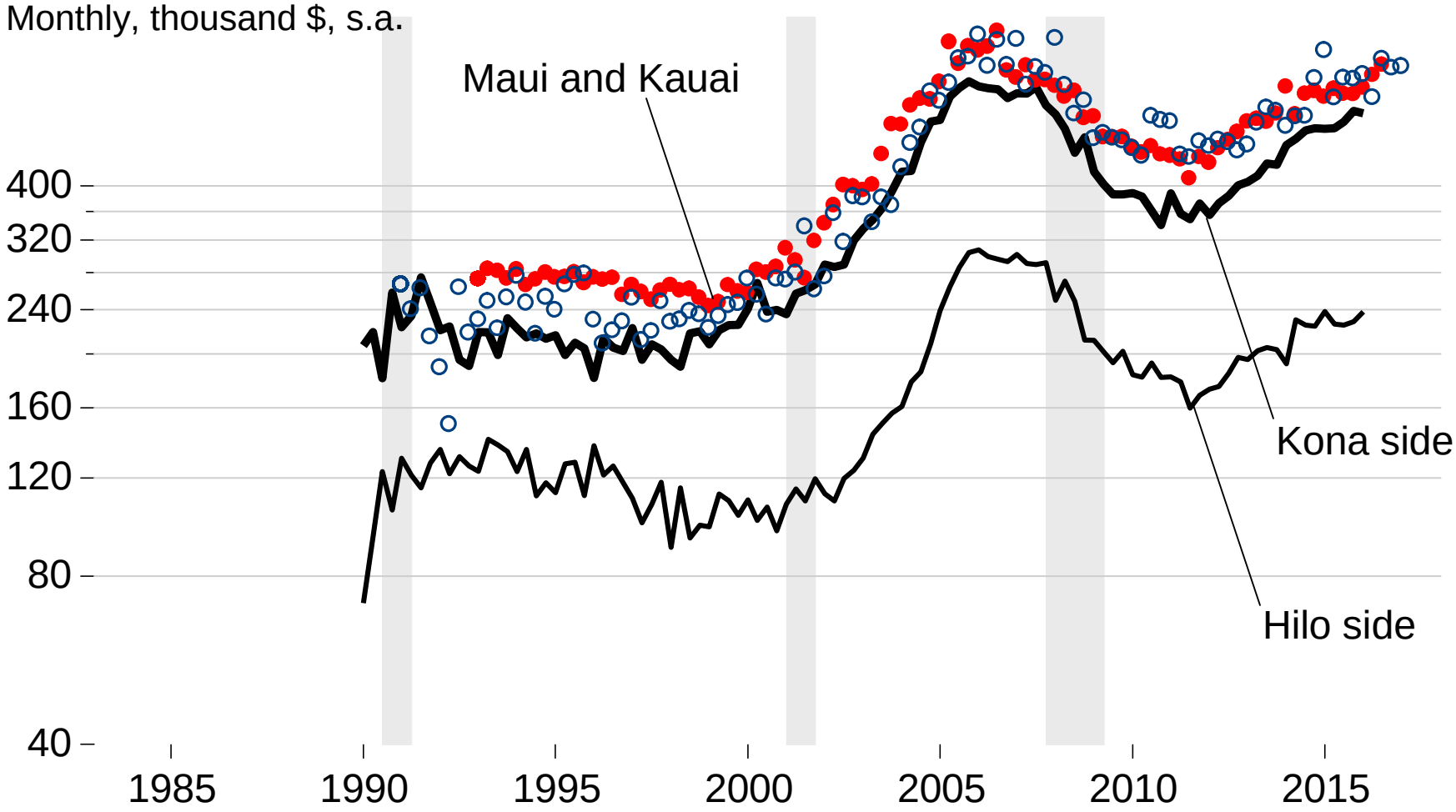
Sources: Realtors Association of Maui, National Association of Realtors; seasonal adjustment by TZE

Big Island single-family median existing home prices also approximate those of San Diego; displaying similar long-run convergence



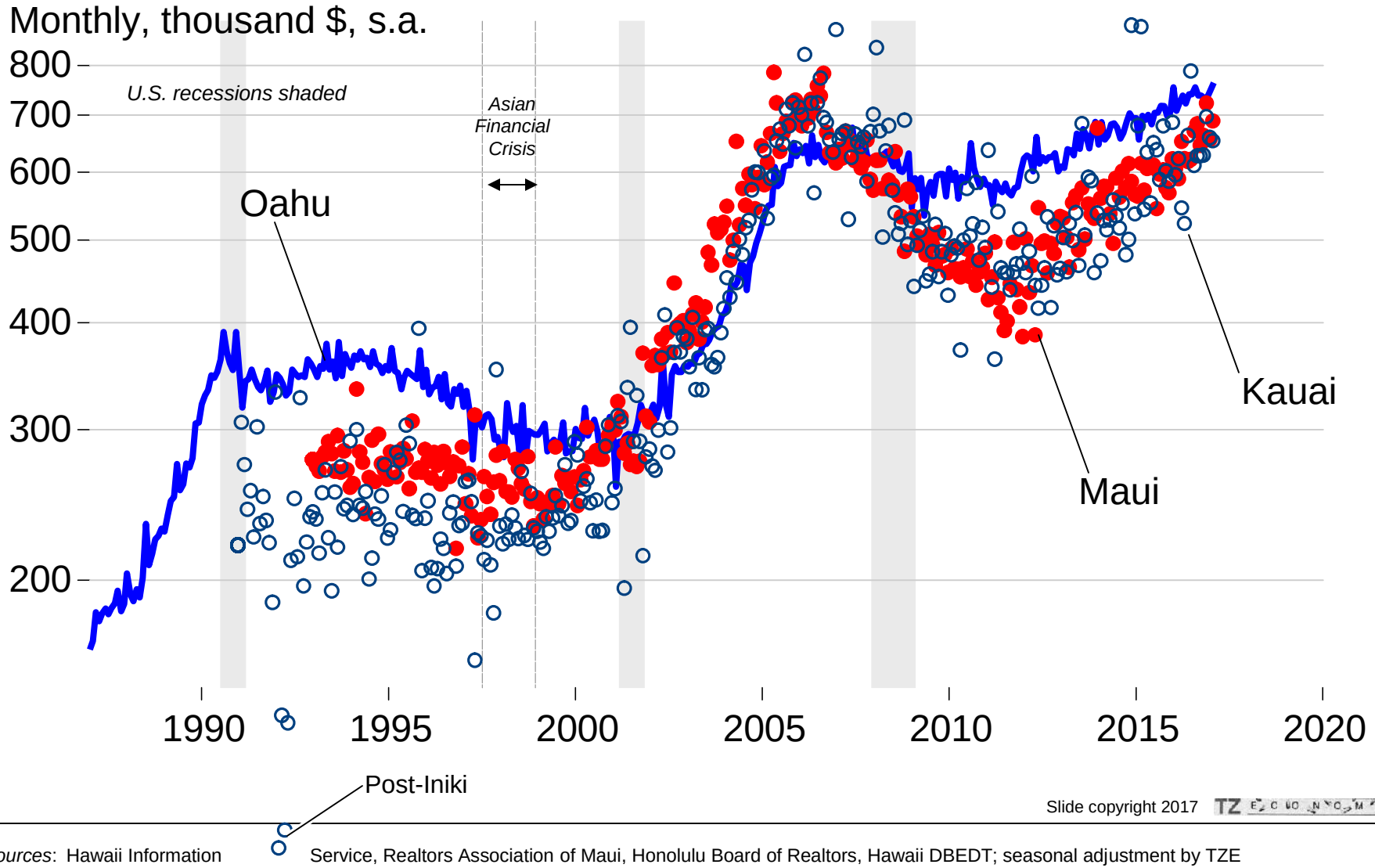
Sources: Hawaii Information Service, National Association of Realtors; seasonal adjustment by TZE

Hilo side of Big Island (not to mention Ka'u (not shown)) systematically cheaper than elsewhere (implying what?)



Sources: Hawaii Information Service, Realtors Association of Maui, Honolulu Board of Realtors, Hawaii DBEDT; seasonal adjustment by TZE

Oahu home prices also correlate highly with most Neighbor Island markets (incl. Kona side of Big Isle), exhibit more resilience



Sources: Hawaii Information Service, Realtors Association of Maui, Honolulu Board of Realtors, Hawaii DBEDT; seasonal adjustment by TZE

Affordable housing policy implications?

- Key issues confronting Kauai in 20-teens cycle: lack of inventory, low production; no quantitatively material increment to housing stock; still, existing home price acceleration has *not* been more acute than during the last two housing cycles
- Question: will appreciation persist through a late-20-teens recession (if any)?
- Housing policy strategy based on "inclusionary zoning" (arbitrary housing production quotas as a condition of development entitlement allocation): a notorious economic policy FAIL that has *increased* the amplitude of the valuation cycle (http://www.uhero.hawaii.edu/assets/UHEROProjectReport2010-1.pdf)
- Kauai existing home price distribution characteristics, similar to all the islands (same on Oahu) commend an alternative, hybrid policy approach:
  1. Ease restriction on development below some quantile threshold, *e.g*. lower half of the distribution of the natural logarithm of Kauai existing home prices
  2. Complementary spatial strategy: ease restrictions near likely nodes of conurbation (*e.g*. defined within arbitrary walk- or drive-time radii)

Housing economics reminder: resist restricting the supply-side

- High Hawaii housing prices (*vs*. mainland), in economic union with perfect capital and labor mobility, are an equilibration mechanism discouraging net in-migration
- *Amplitude* of housing's asset-pricing cycle in Hawaii exacerbated by two factors:*
  1. Geographic scarcity (mountains, oceans) ultimately prevents urban footprint from radiating spatially across cheaply developed, flat land
  2. Regulatory scarcity (barriers to entry) imposed for good reasons (agricultural land preservation) as well as bad (oligopolistic rivalry; The Politics of NIMBY)

  Constraints *reduce* the price elasticity of the flow supply of housing: facing rising demand, the housing market "clears" via home price acceleration
- Good economic fundamentals—rising exports (tourism), employment, income, wealth (stock + home prices), offshore investors—raise urban housing demand
- The single most important policy change to reduce the amplitude of an incipient house price cycle would be to reduce regulatory restrictions on new housing supply

*Investors should get the same long-run total return on housing (capital gain—price appreciation—plus "the dividend" of living in the house) regardless of whether it is in Hawaii or Iowa, no offense to either location, up to idiosyncratic risk premia

Complex dynamics: overshooting + oscillation

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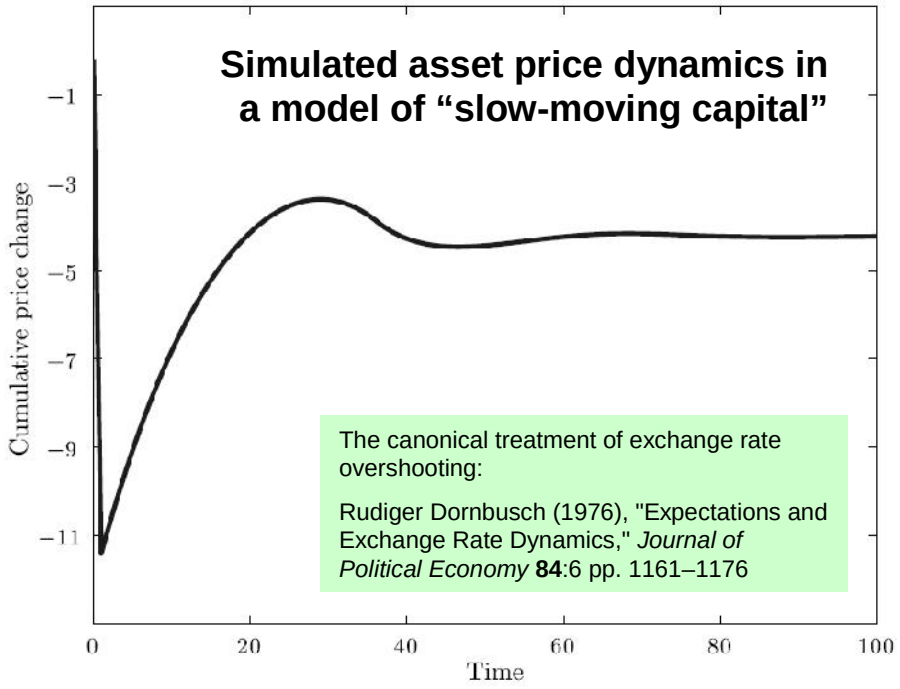
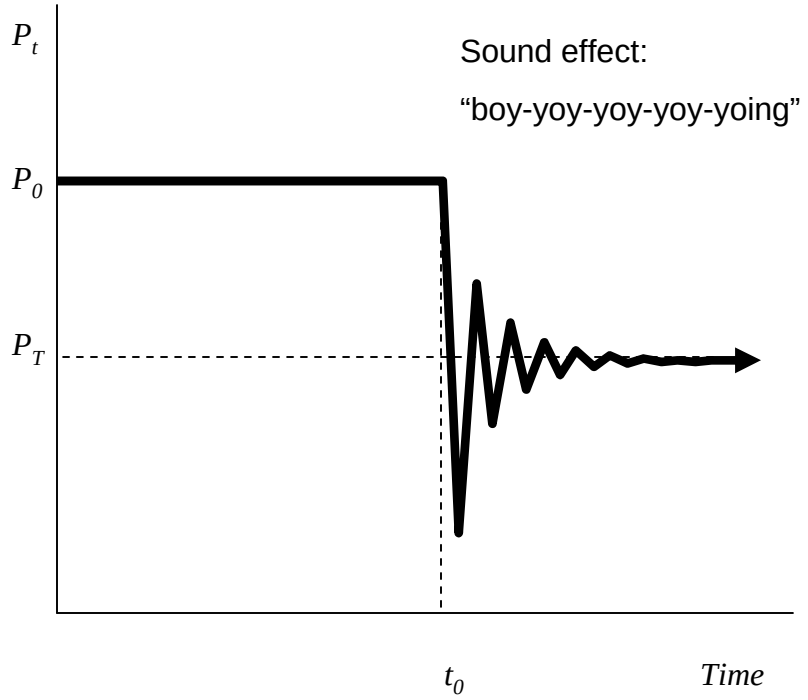
"Overshooting" models of asset price dynamics



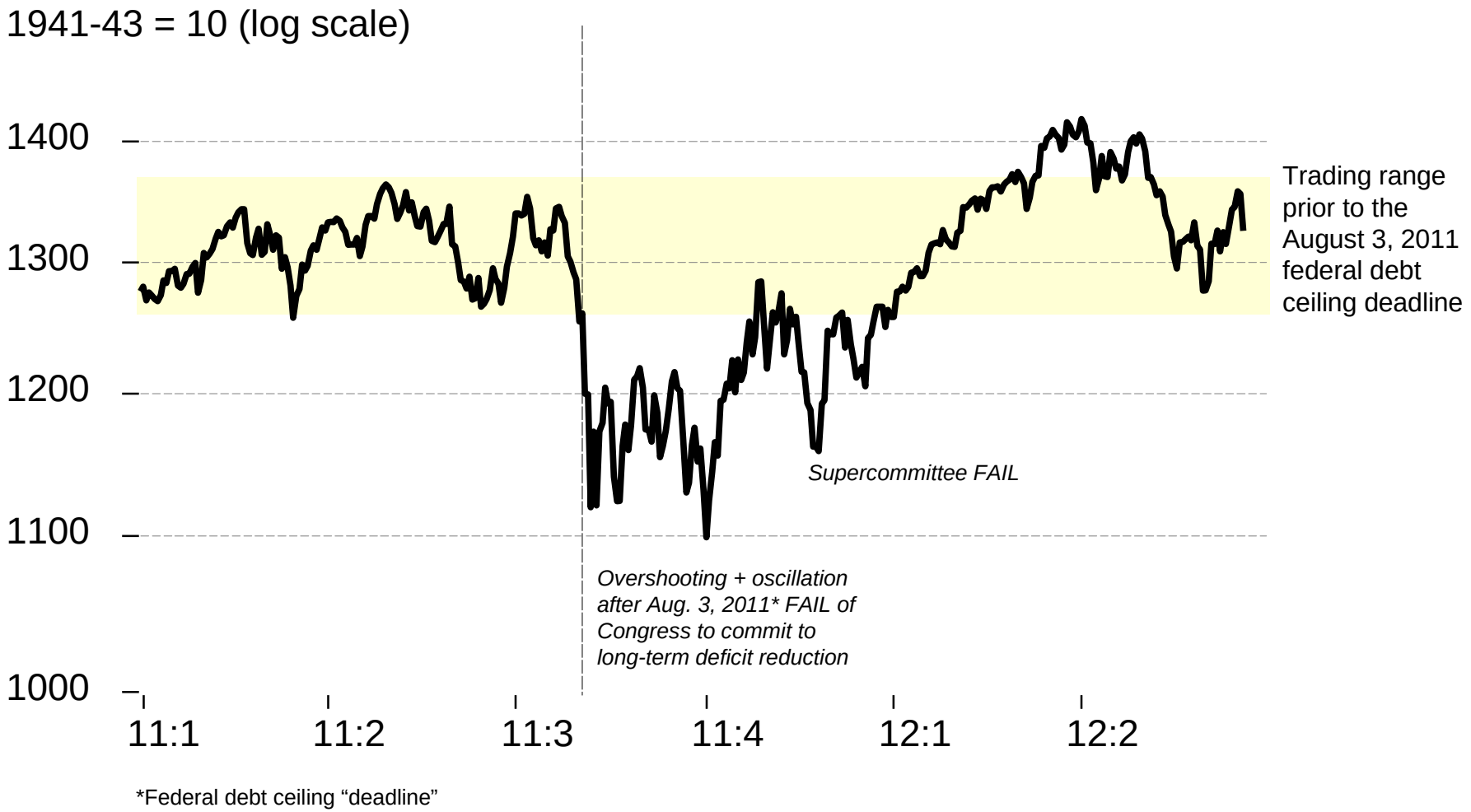
"The key implication is that supply or demand shocks must be absorbed on short notice by a limited set of investors. The risk aversion or limited capital of the currently available investors, including intermediaries, leads them to require a price concession in order to absorb the supply or demand shock. They plan to 'lay off' the associated risk over time as other investors become available. As a result, the initial price impact is followed by a price reversal that may occur over an extended period of time."



Simulated asset price dynamics in a logistic growth model

Sources: Darrell Duffie, "Asset Price Dynamics with Slow-Moving Capital" *Journal of Finance* vol. 65 no. 4 (August 2010) pp 1239-1267 (http://www.darrellduffie.com/uploads/pubs/DuffieAFAPresidentialAddress2010.pdf); TZ Economics calculations

S&P 500 Index: overshooting + oscillation after Congressional FAIL (Aug. 3, 2011; Nov. 23, 2011)



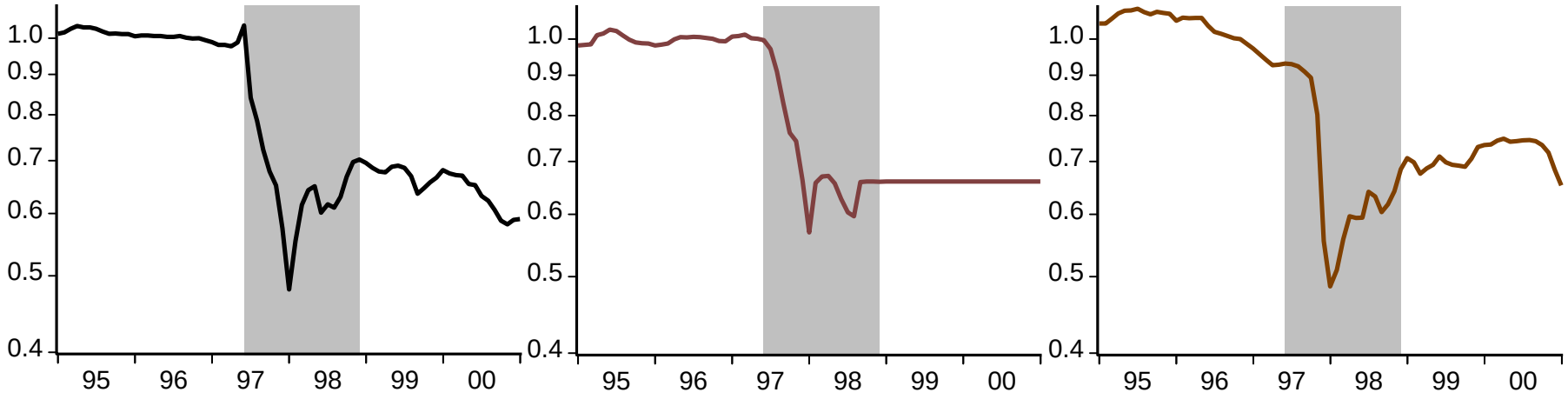
*Federal debt ceiling "deadline"

Sources: Standard & Poor's, Federal Reserve Bank of St. Louis; daily closing data through June 21, 2012

Exchange rate depreciation, overshooting and oscillatory convergence in the Asian Financial Crisis

Scale: Jan. 1996 – Jun. 1997 = 1.0

Initial, precipitous depreciation of the Thai baht was quickly followed by the Malaysian ringgit and shortly after by the Korean won



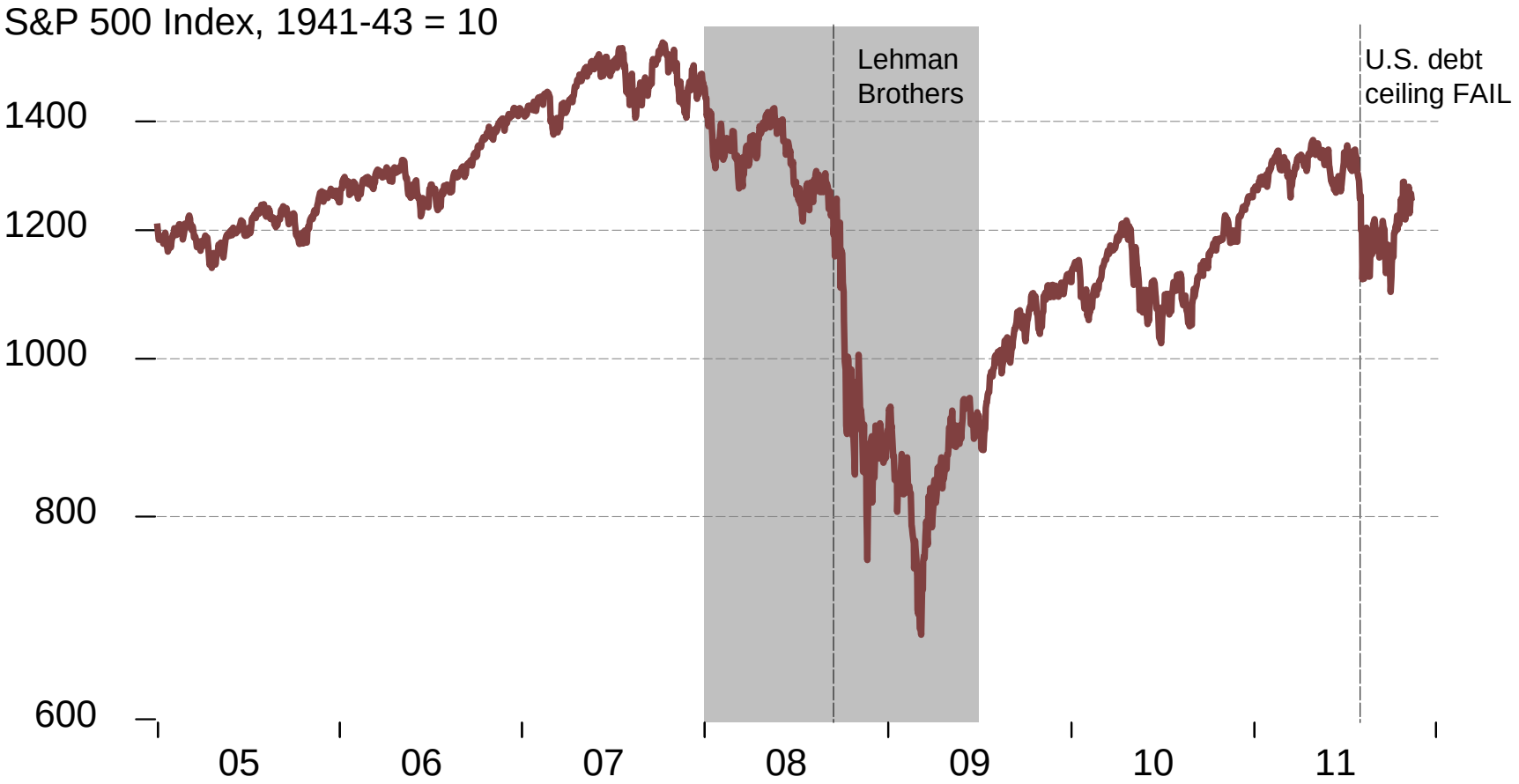
Thai baht | Malaysian ringgit* | South Korean won

Shaded areas denote Asian Financial Crisis

*Malaysia closed the capital window in August 1997 and suspended Ringgit convertability at that time for several years

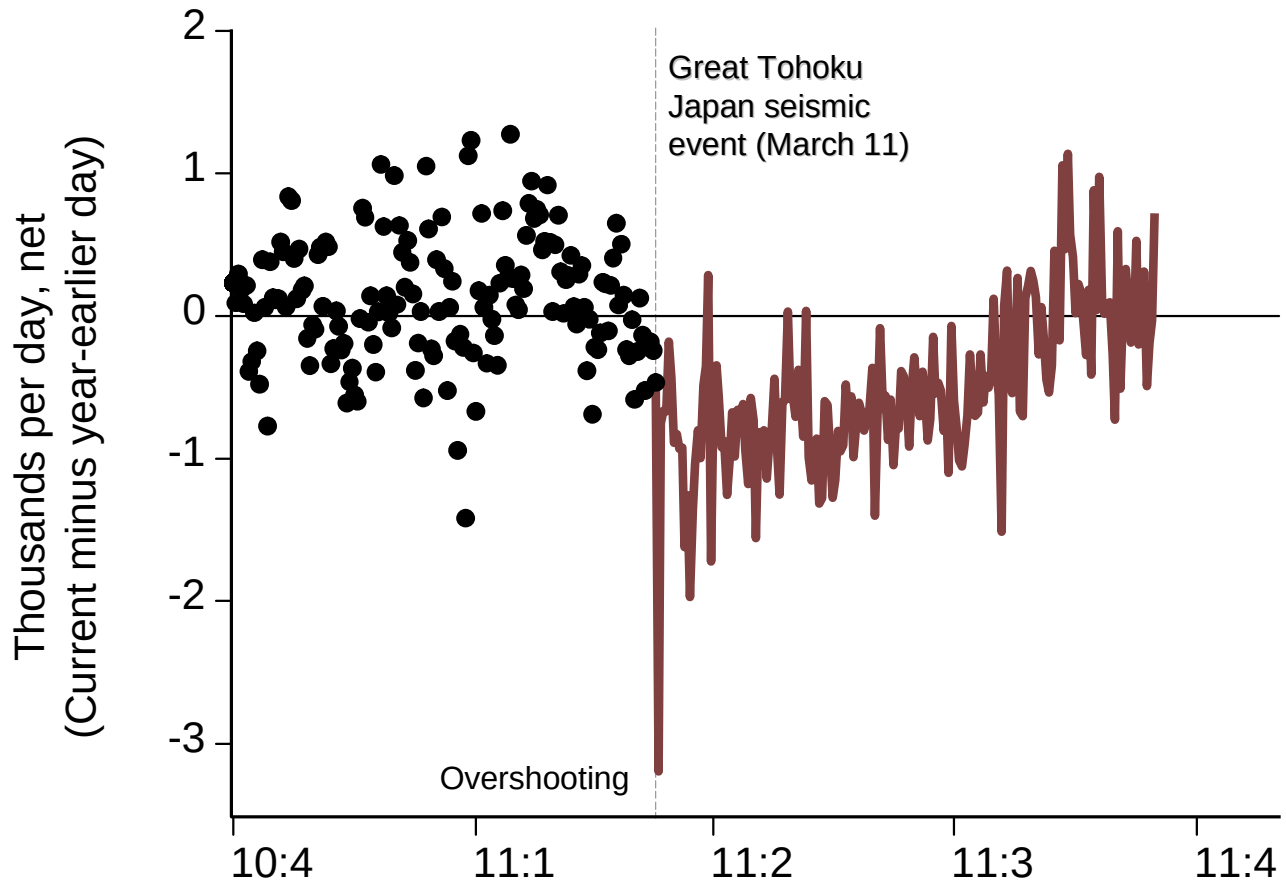
Source: FRED II; indexes of currency values in January 1997 – June 1997 U.S. dollars calculated by TZE

S&P 500 Index through Lehman Bros. collapse



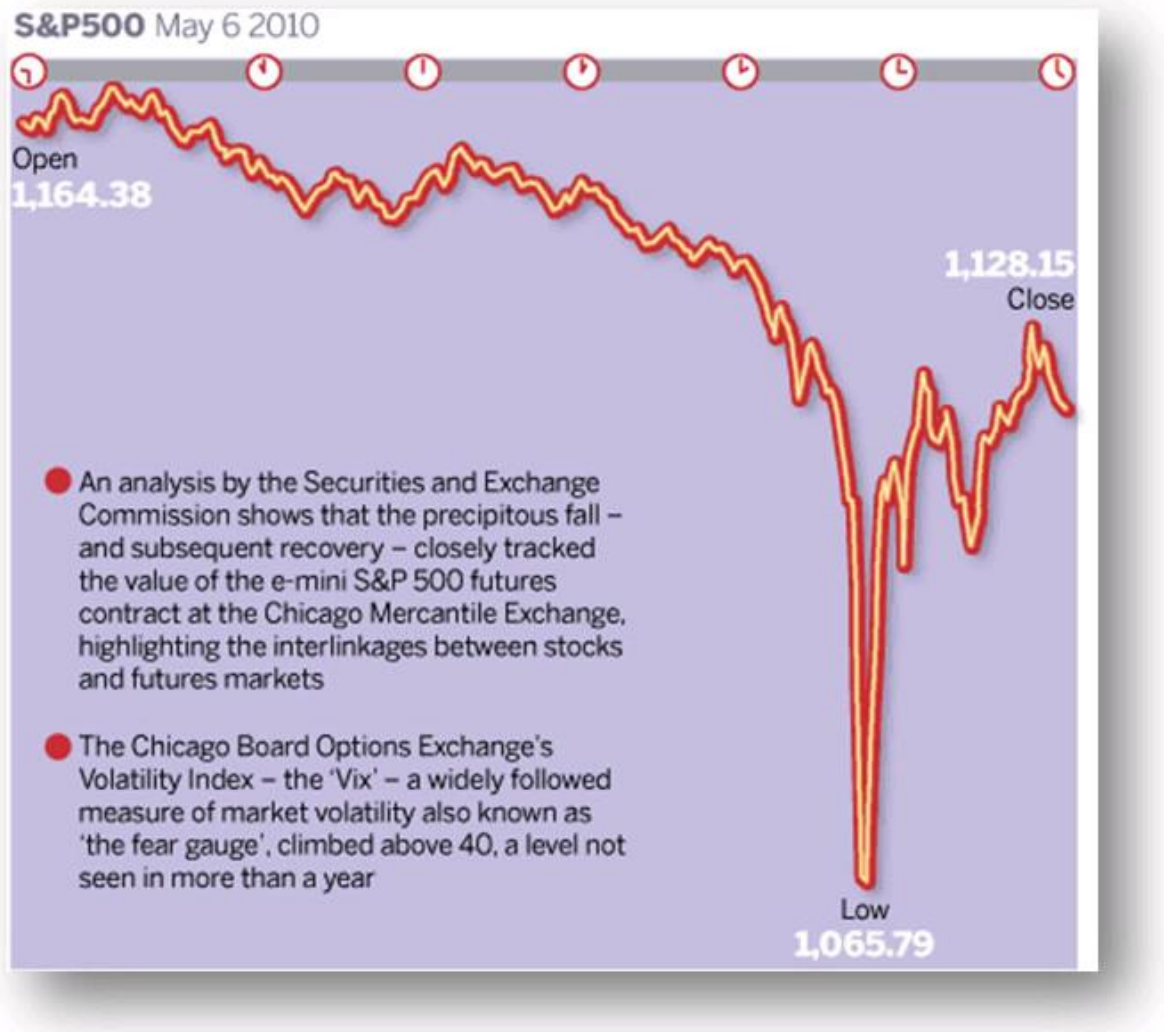
Sources: Standard & Poor's, Federal Reserve Bank of St. Louis; daily data through Monday, November 14, 2011

Change in daily Japanese passengers to Hawaii



Sources: Hawaii DBEDT; calculations on daily passenger counts by TZ Economics through mid-September 2011

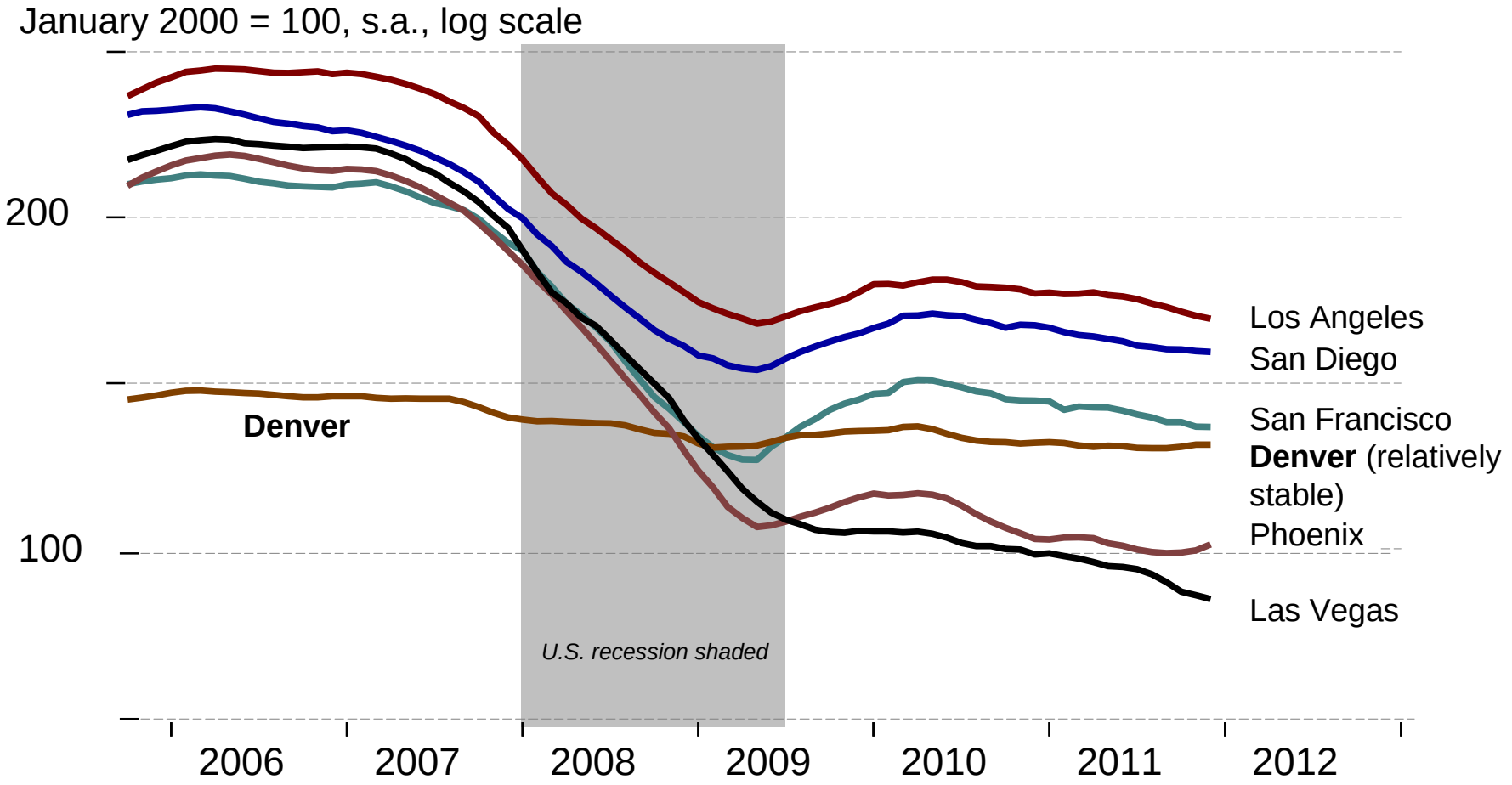
Intra-day S&P 500 May 6, 2010 "Flash Crash"



–8.5%

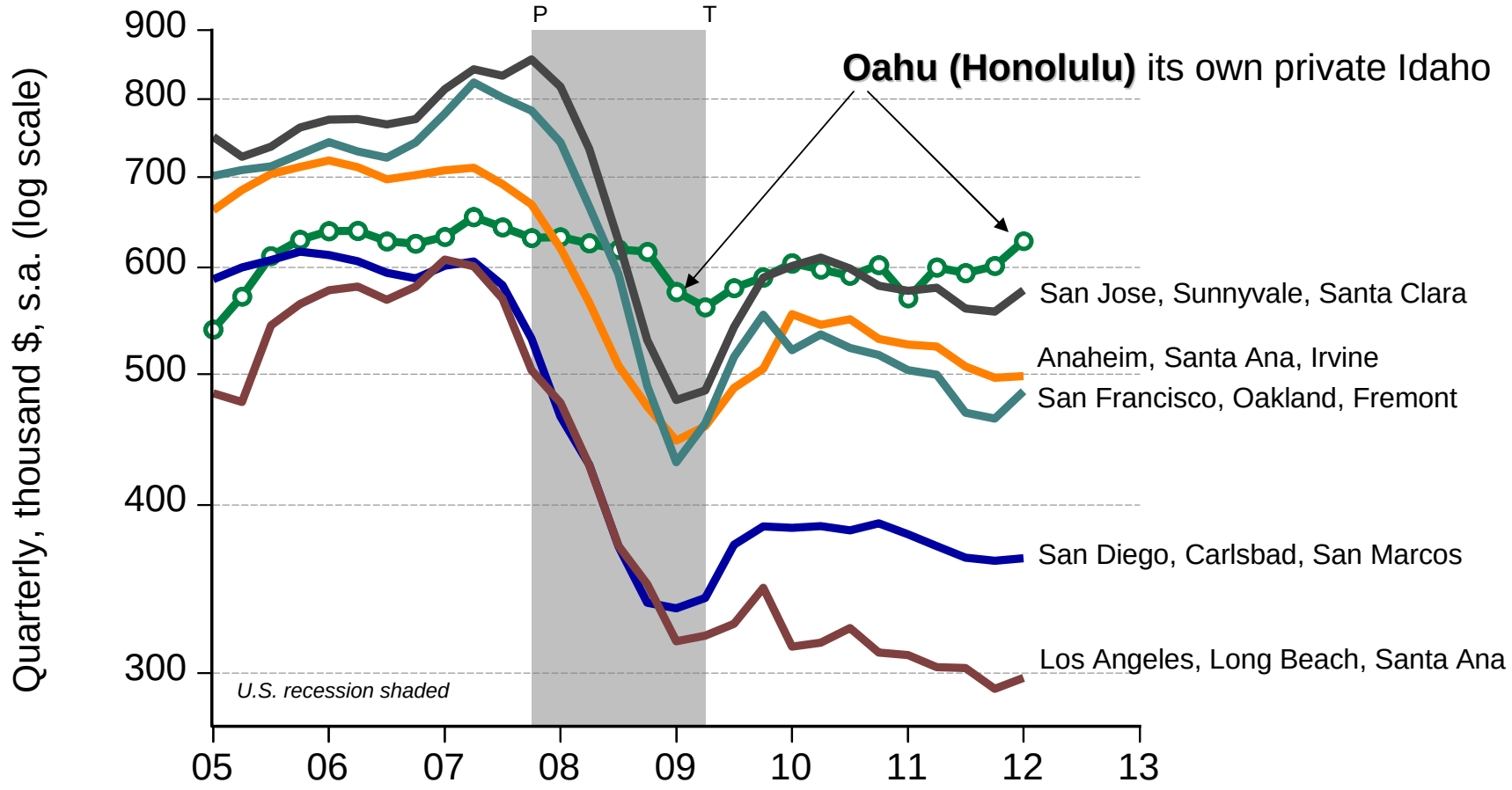
Source: http://www.marketoracle.co.uk/images/2010/Jun/flash-crash-4-2.jpg

S&P Case-Shiller price indexes (relative to Jan 2000): "double-dip" is same as overshooting + oscillation



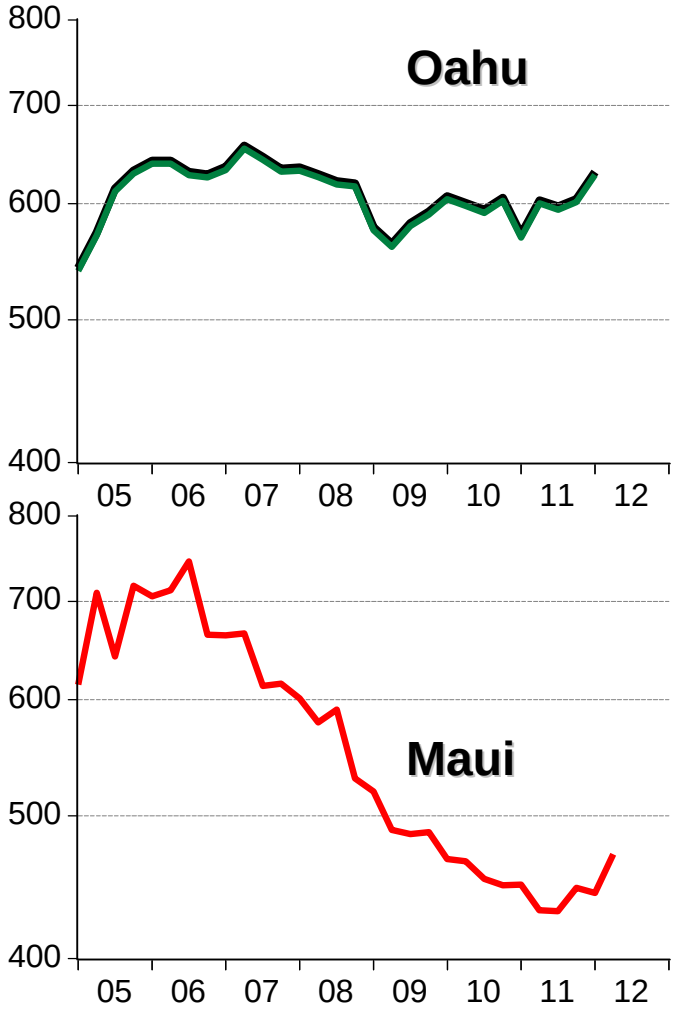
Sources: Standard & Poor's; seasonal adjustment using Census X-12 filter by TZ Economics

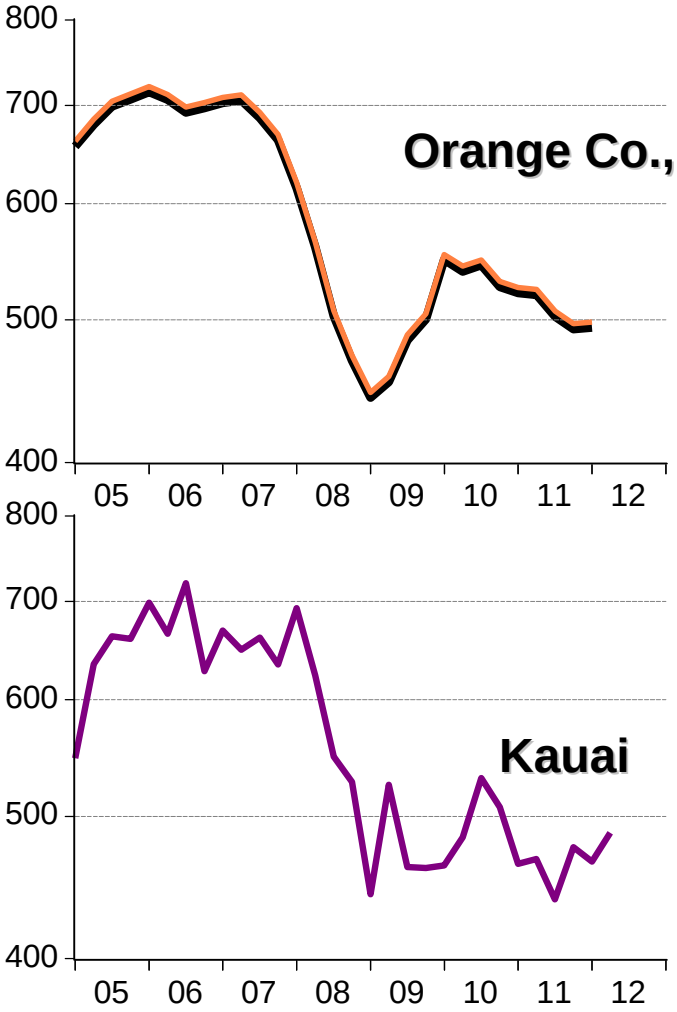
Median CA existing single-family home prices: "double-dip" or "overshooting + oscillation?"



Sources: Honolulu Board of Realtors, National Association of Realtors; seasonal adjustment by TZE using Census X-12 ARIMA filter, data through first quarter 2012

Oahu housing market most resilient—relatively—of Hawaii Islands and many mainland urban markets





Sources: Honolulu Board of Realtors, Realtors Association of Maui, National Association of Realtors, Kauai Board of Realtors / Hawaii Information Service; seasonal adjustment by TZE using Census X-12 ARIMA filter

Pau (lecture 2 of 2)

Appendix: Aspects of the 2007-08 housing-led financial crisis impacts in Hawaii

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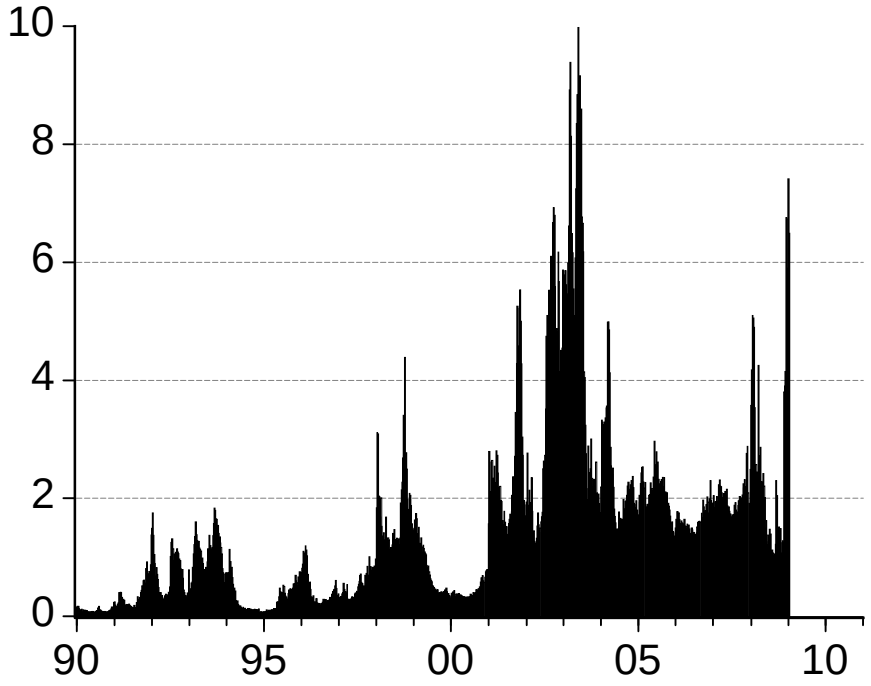
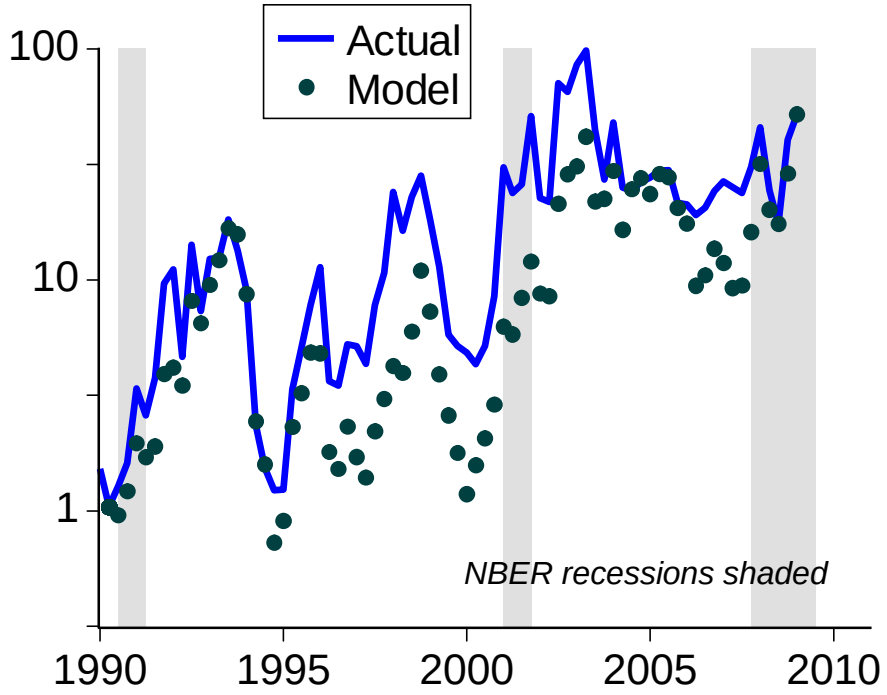
Regional variation in home price movements and contagion through financial channels of transmission

- Mortgage lenders historically have relied on geographic diversity of housing market performances as one source of *portfolio* risk mitigation (why?*)
- Financial innovation introduced increasingly complex structures through which to hold housing market risk exposure with superior risk-adjusted returns
- Mortgage-backed securities (MBS) issued from geographically diverse pools of underlying mortgages have lower risk than holding the individual mortgage assets
- Collateralized debt obligations (CDO) constructed from MBS tranche and prioritize risk exposures: large AAA-rated pools created by subordinating risk into higher-risk mezzanine (A) and equity (B) tranches
- Credit default swaps (CDS) "wrapped" as insurance around MBS and CDO exposures, allowing counterparties to exchange default exposure positions (in the event of default, one counterparty compensates the other)
- Problem: regionally correlated home price movements set off a contagion event, asset price declines were then exacerbated by "fire sales" externality, exposures concentrated in systemically-important financial institutions (SIFIs)

*Varying house price movements from region to region or, ideally, *negative covariation* (movements in *opposite* directions) can reduce the variance of portfolio returns when mortgage loan assets originated in different regions are blended together. Correlated house price declines *amplify* risk into a contagion event.

MBA refinancing index and regression model: when interest rates go down, refi volume goes up (adjusted for home price movements)

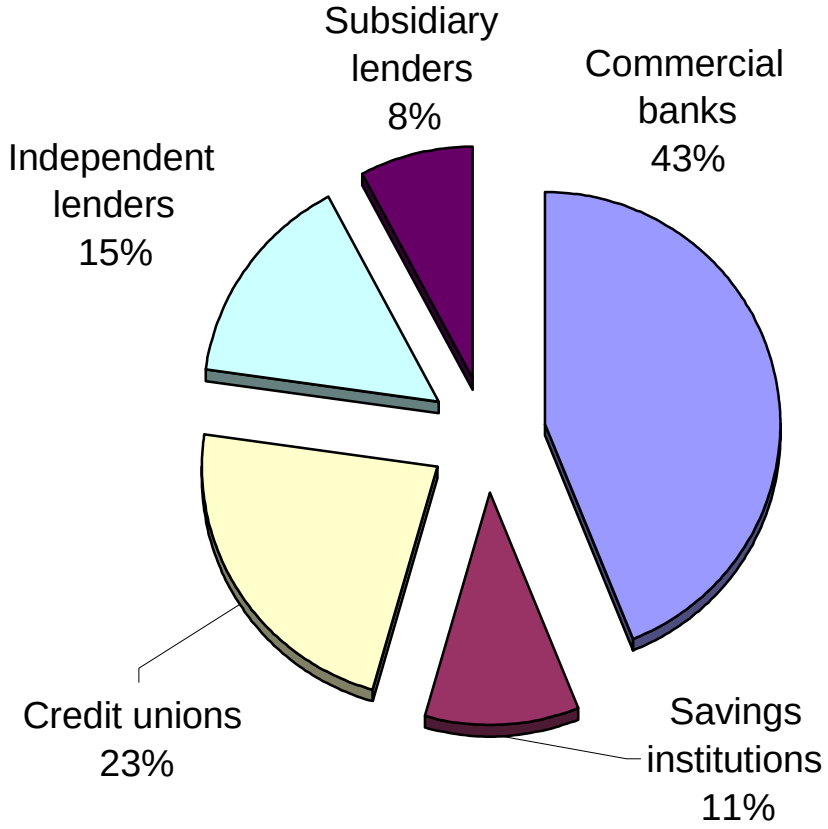




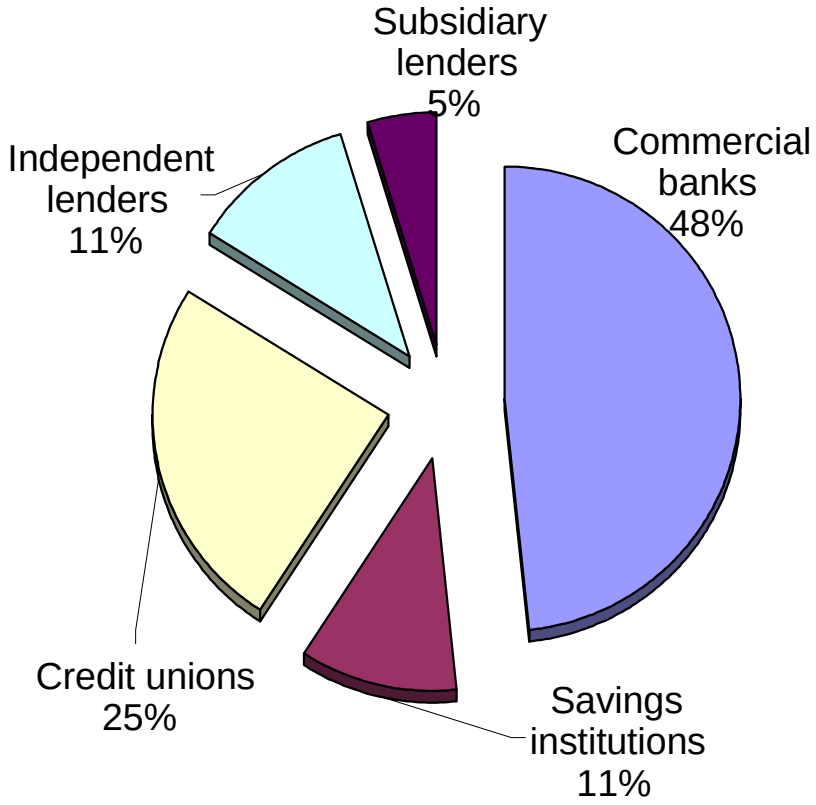
d(ln(MBAVREFI)) = –0.1236 + 7.2008*d(ln(OFHEO)) – 0.1335*d(GS3M) – 1.0601*d(GS10)
(–2.6724) (2.3162) (–1.7223) (–11.4826)

Source: Mortgage Bankers Association, Bloomberg, Office of Federal Housing Enterprise Oversight; author's calculations (t-statistics in parentheses)

FFIEC-reporting home mortgage lenders



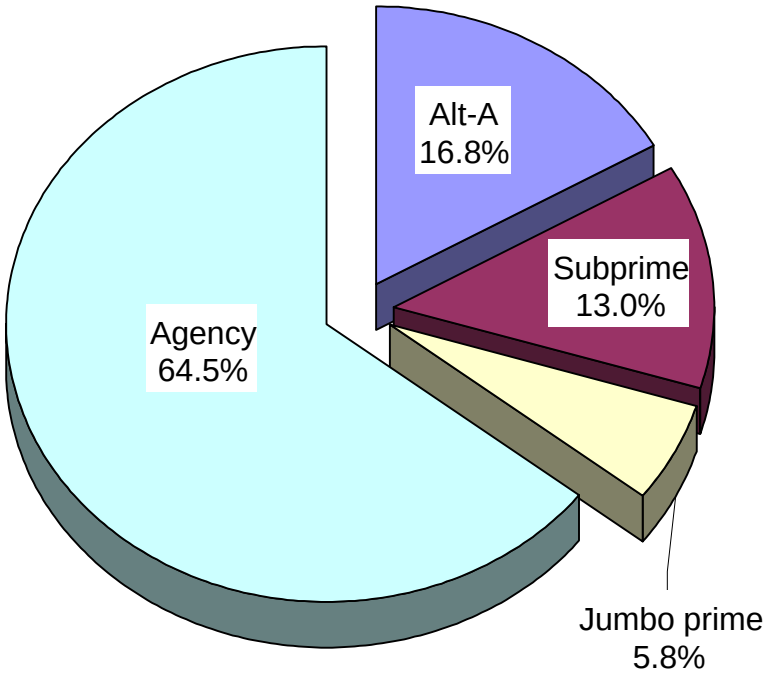
2006: 8,848 institutions



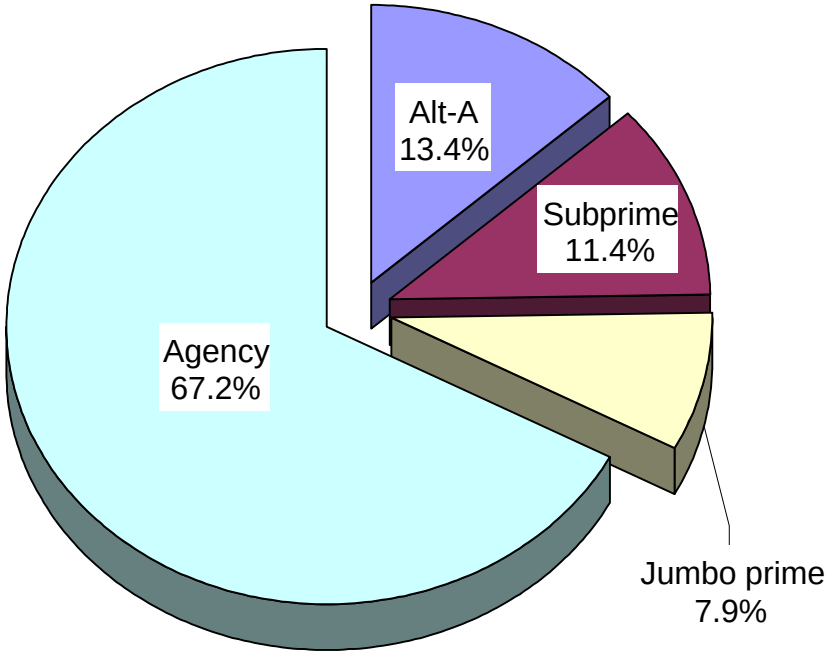
2009: 8,124 institutions

Source: *Federal Reserve Bulletin* http://www.federalreserve.gov/pubs/bulletin/2010/pdf/hmda2009.pdf

Distributions of mortgage-backed securities: *"ex ante"* risk in 2007



Hawaii $44.387 billion



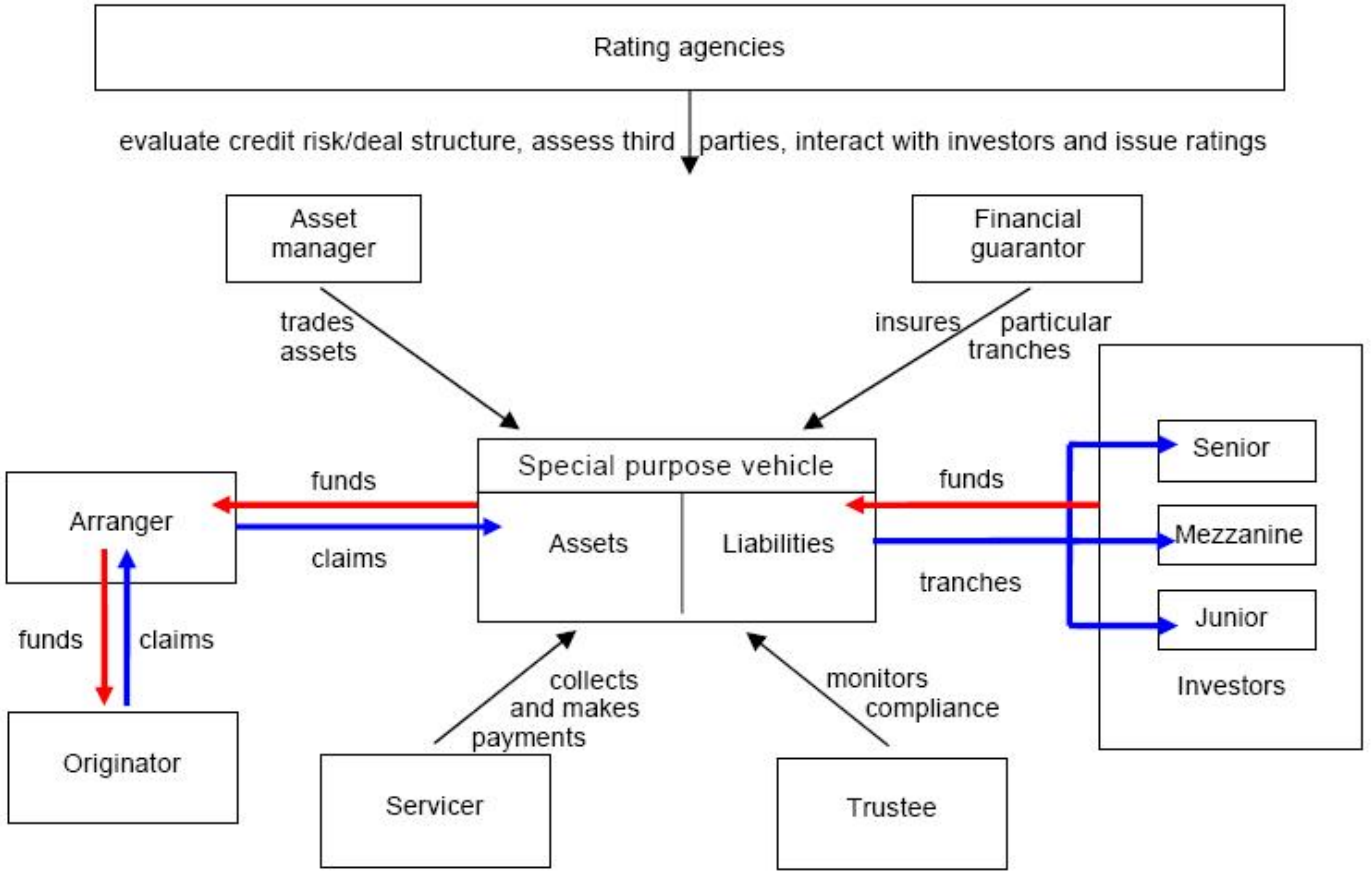
U.S. total $6.607 trillion

Sources: Loan Performance; calculations courtesy Liang Lee, Bank of Hawaii

Securitization complexity—read from left to right

Securitisation markets: key participants

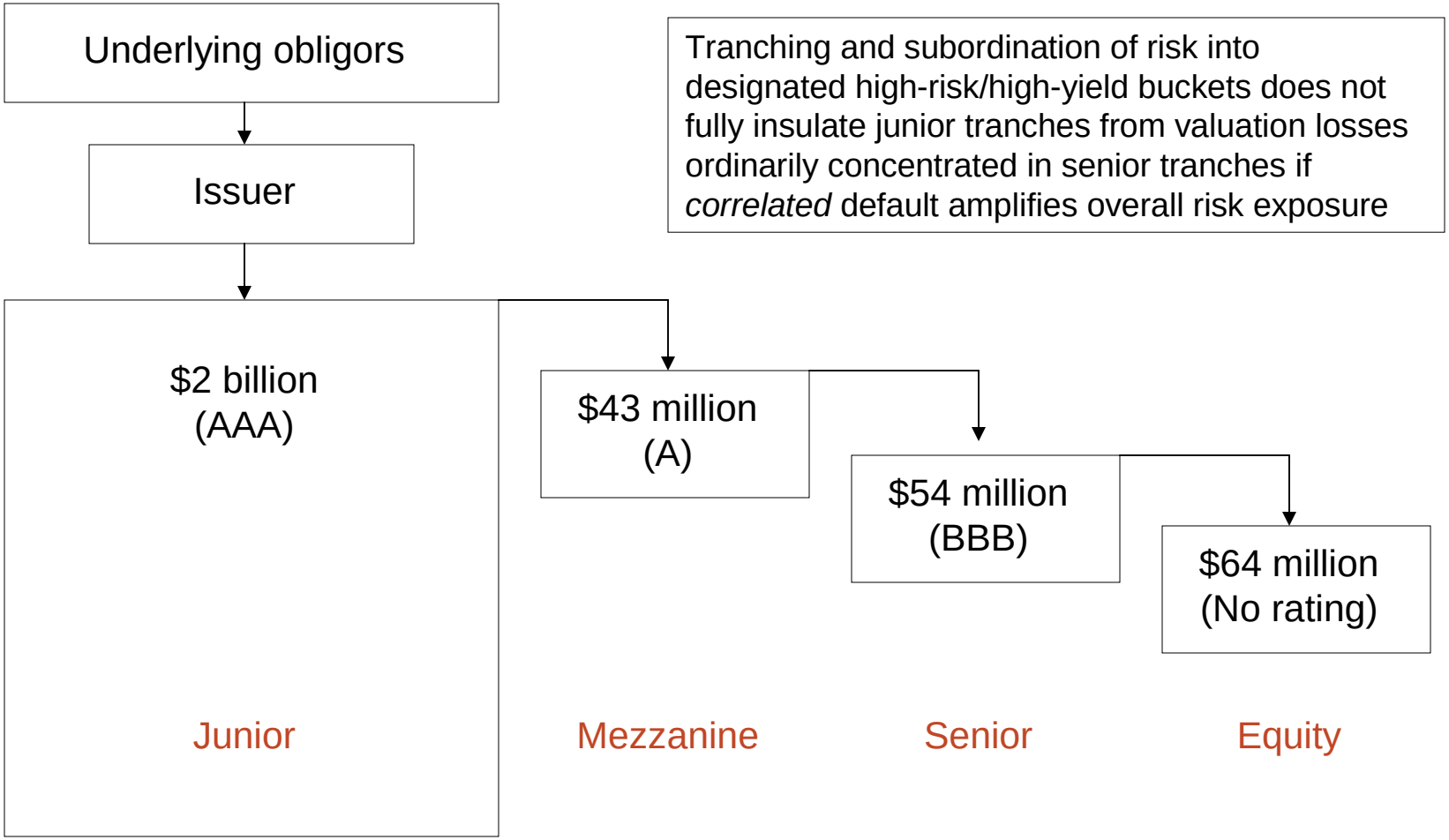
Stylised overview of the "players" involved in securitisations and of their respective roles



Source: Adapted from Fender and Mitchell (2005). Graph 2

Source: Ingo Fender and Janet Mitchell, "The future of securitisation: how to align incentives? " *BIS Quarterly Review* (September 2009) http://www.bis.org/publ/qtrpdf/r_qt0909e.pdf

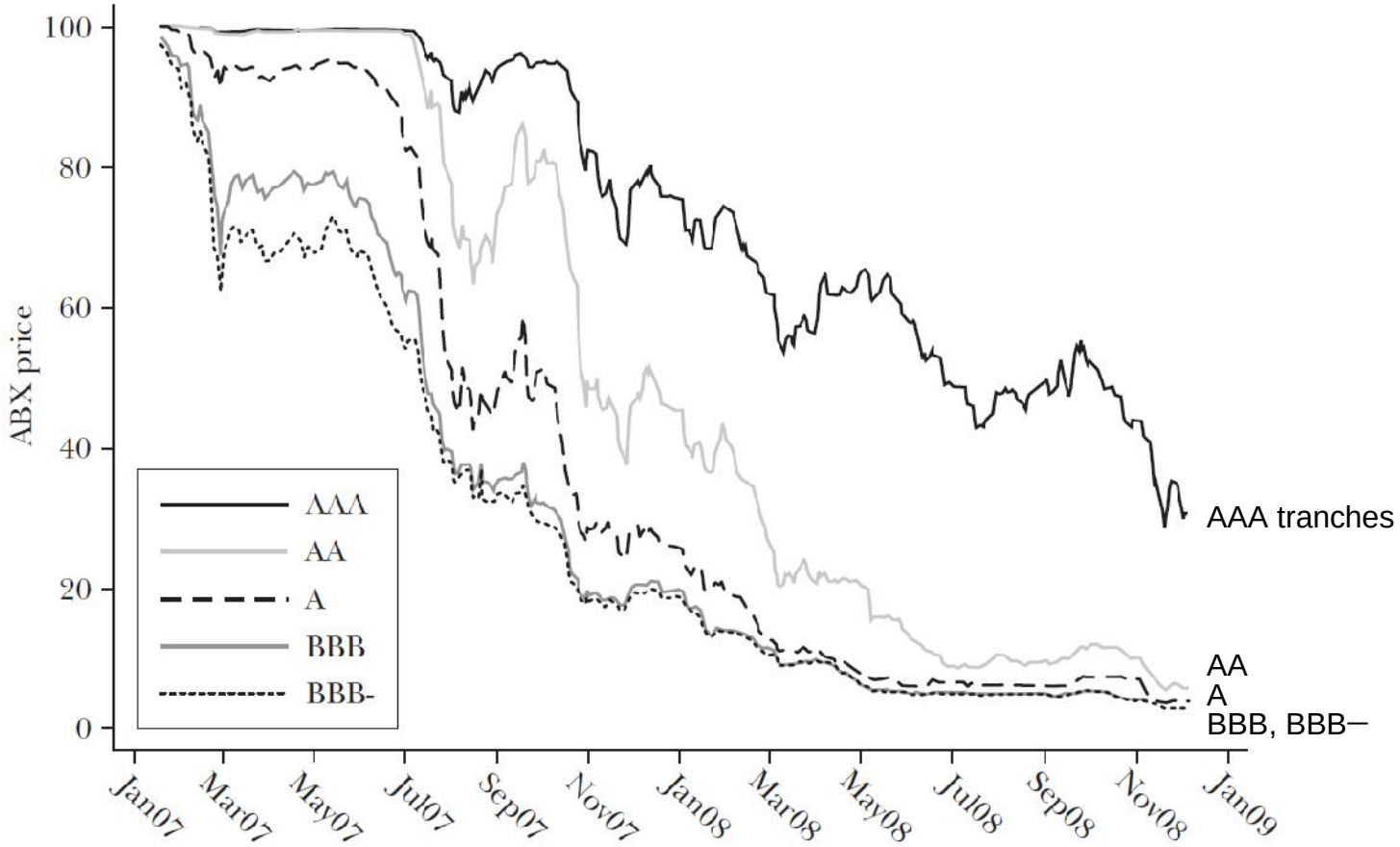
Prototypical CDO tranching structure



Tranching and subordination of risk into designated high-risk/high-yield buckets does not fully insulate junior tranches from valuation losses ordinarily concentrated in senior tranches if *correlated* default amplifies overall risk exposure

Source: Darrel Duffie and Ken Singleton, *Credit Risk* (2003) Princeton University Press

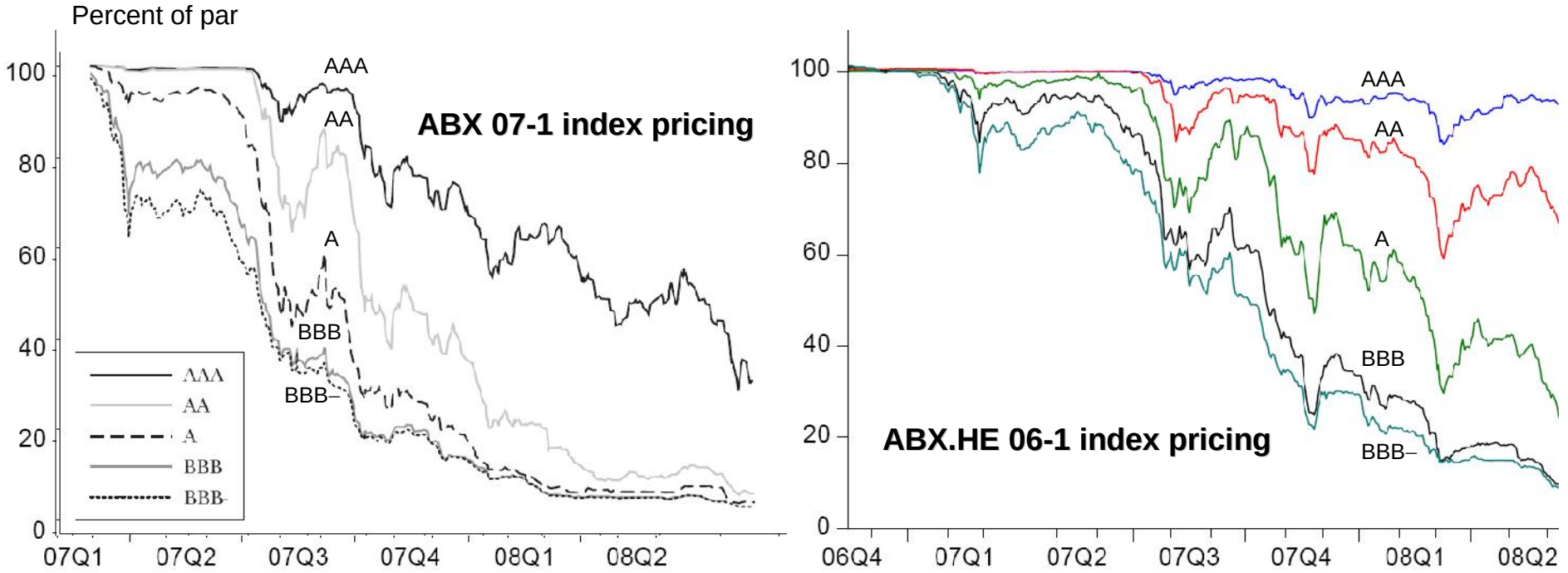
Mortgage credit default swap (CDS) ABX indices: ABX 7-1 series initiated in January 2007 reveals what happened to values of underlying CDO tranches



Each ABX line is based on a basket of 20 credit default swaps referencing asset-backed securities containing subprime mortgages. Investor pays fee (spread) to guarantee index price of 100. After initiation protection buyer pays (100–ABX price); as ABX price drops, fee rises and previous CDS sellers suffer losses

Source: Markus K. Brunnermeier, "Deciphering the Liquidity and Credit Crunch 2007-2008, *Journal of Economic Perspectives* vol. 23 no. 1 (Winter 2009) pp. 77-100

Sub-prime mortgage-related risk pricing also revealed severed loss of value in 2007-09—precipitating liquidity crisis after Lehman (Sep 08)

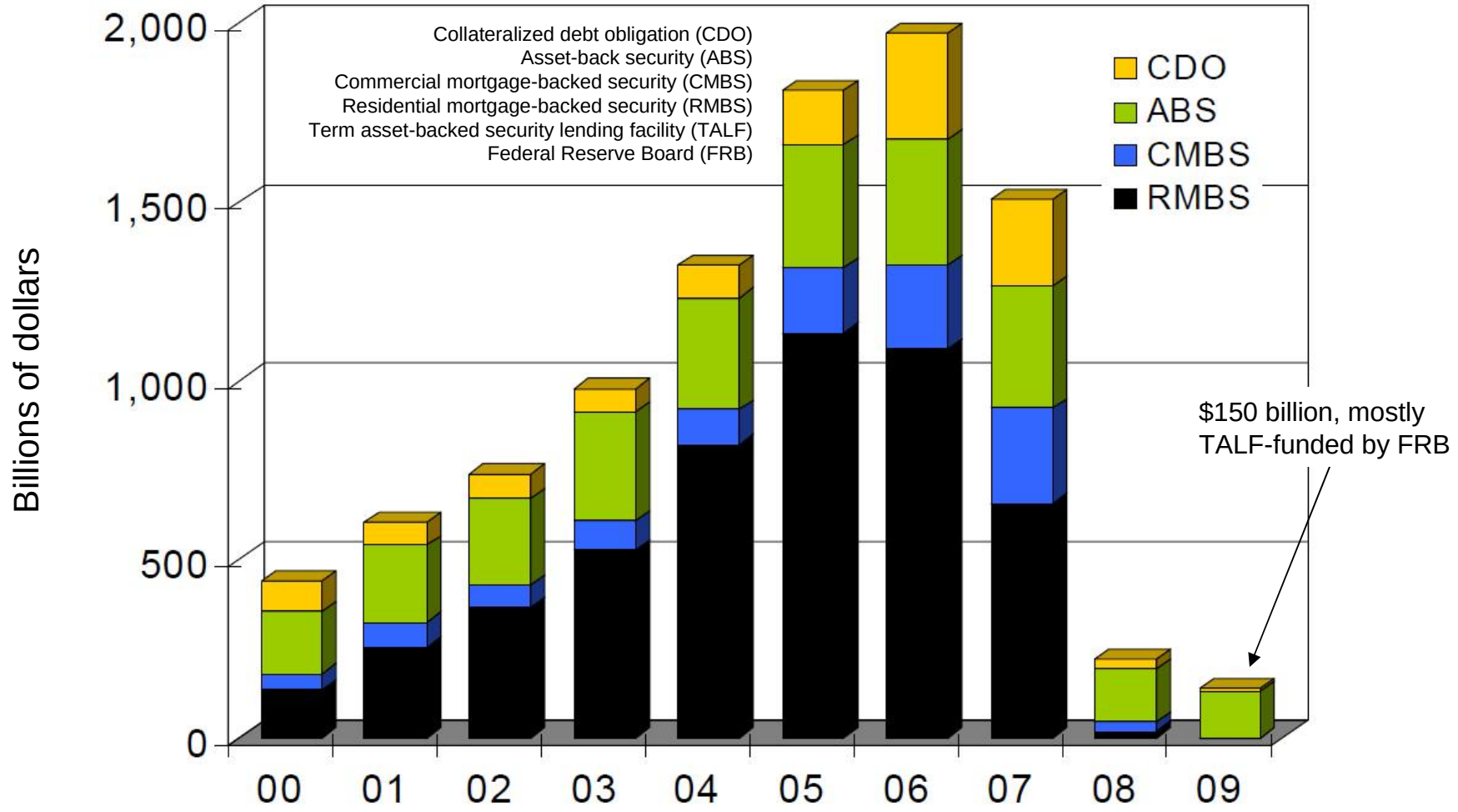


Based on baskets of 20 CDS-referencing asset-backed securities containing sub-prime mortgages and home equity loans of different ratings; after initiation, fee (spread) that buyer pays is (100 – ABX price), plus, the upfront fee that previous sellers pay rises if ABX falls

Sources: Graph on left based on data from Markit, via Lehman Live, as published in Markus Brunnermeier, "Deciphering the Liquidity and Credit Crunch 2007-2008, "*Journal of Economic Perspectives,* Vol. **23** No. 1 (Winter 2009) pages 77-100; graph on right is Chart 3. in Ingo Fender and Martin Scheicher, "The pricing of subprime mortgage risk in good times and bad: evidence from the ABX.HE indices," *Bank for International Settlements Working Papers No. 279* (March 2009), page 38.

Note: Time (horizontal) scales are slightly different, as in originals

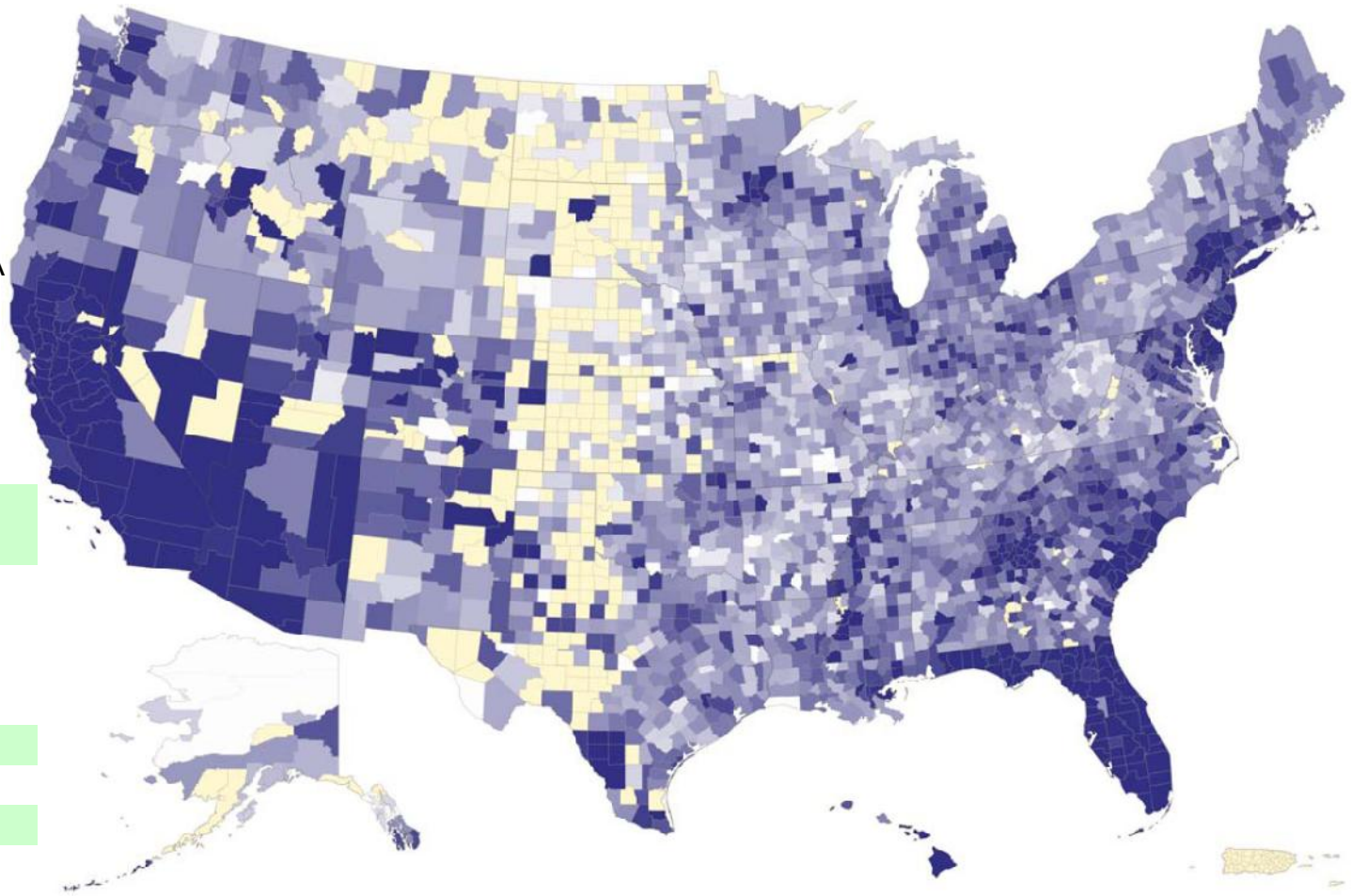
Implosion in financially-innovative credit channels (securitization)



Source: Financial Crisis Inquiry Commission Testimony of Mark Zandi of Economy.com (January 2010) http://www.fcic.gov/hearings/pdfs/2010-0113-Zandi.pdf (source given as Thomson Reuters)

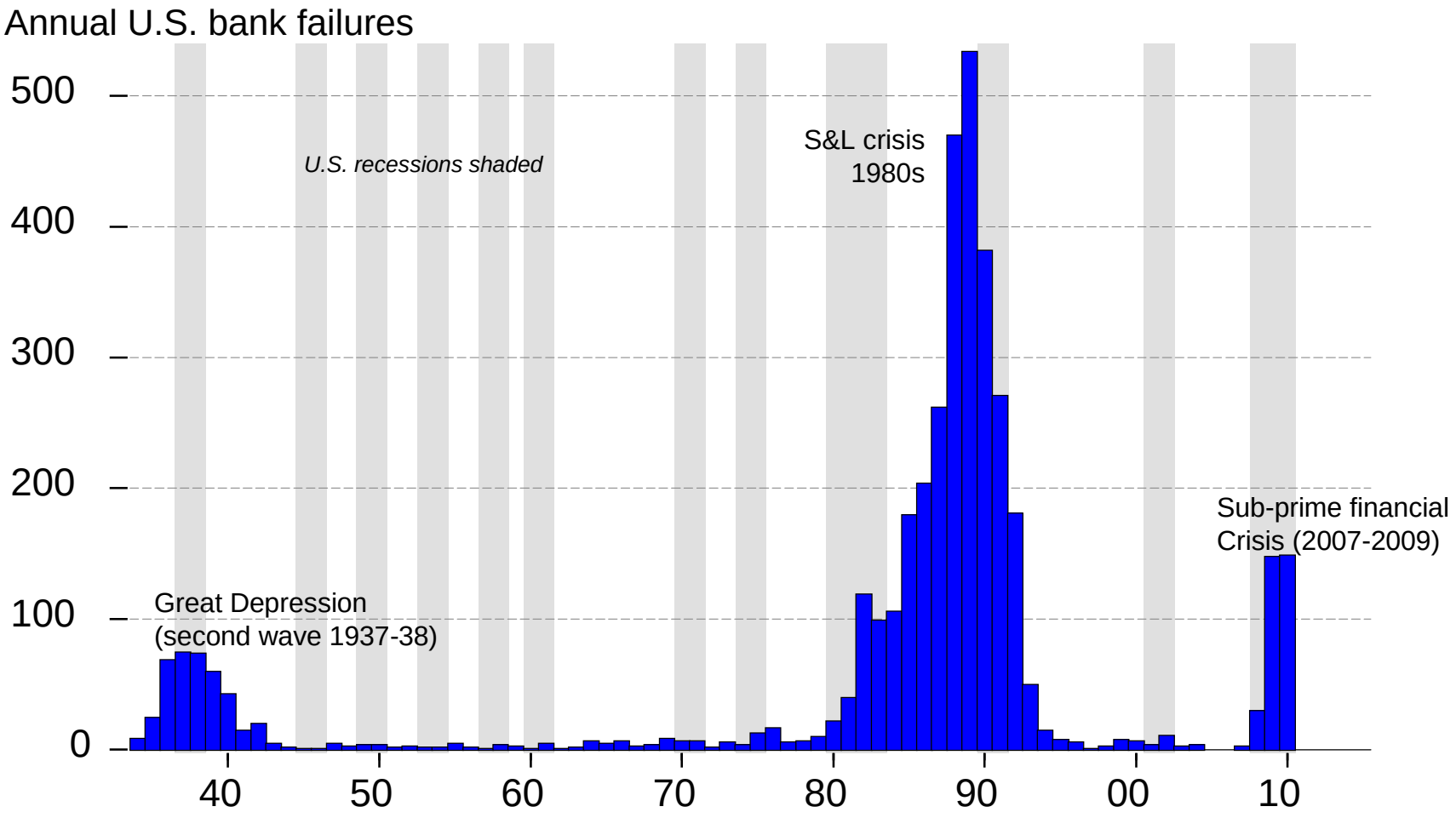
Mortgage delinquency near cyclical peak (2010Q3)
ñ90 days past due by county (darker is higher)

22.7	Dade, FL
18.3	Broward, FL
15.9	Palm Beach, FL
15.6	Clark, NV
13.6	Riverside, CA
13.2	San Joaquin
12.8	San Bernadino, CA
11.4	Bronx, NY
10.1	Maricopa, AZ
9.4	Sacramento, CA
9.1	Contra Costa, CA
8.8	Los Angeles, CA
8.2	*Hawaii, HI*
7.6	*Maui, HI*
7.6	San Diego, HI
6.9	Orange, CA
5.9	Santa Clara, CA
5.3	**U.S. average**
4.5	*Kauai, HI*
3.7	San Francisco, CA
3.4	*Honolulu, HI*
1.8	Dane, WI
1.0	Cherry, NE
0.0	Todd, SD



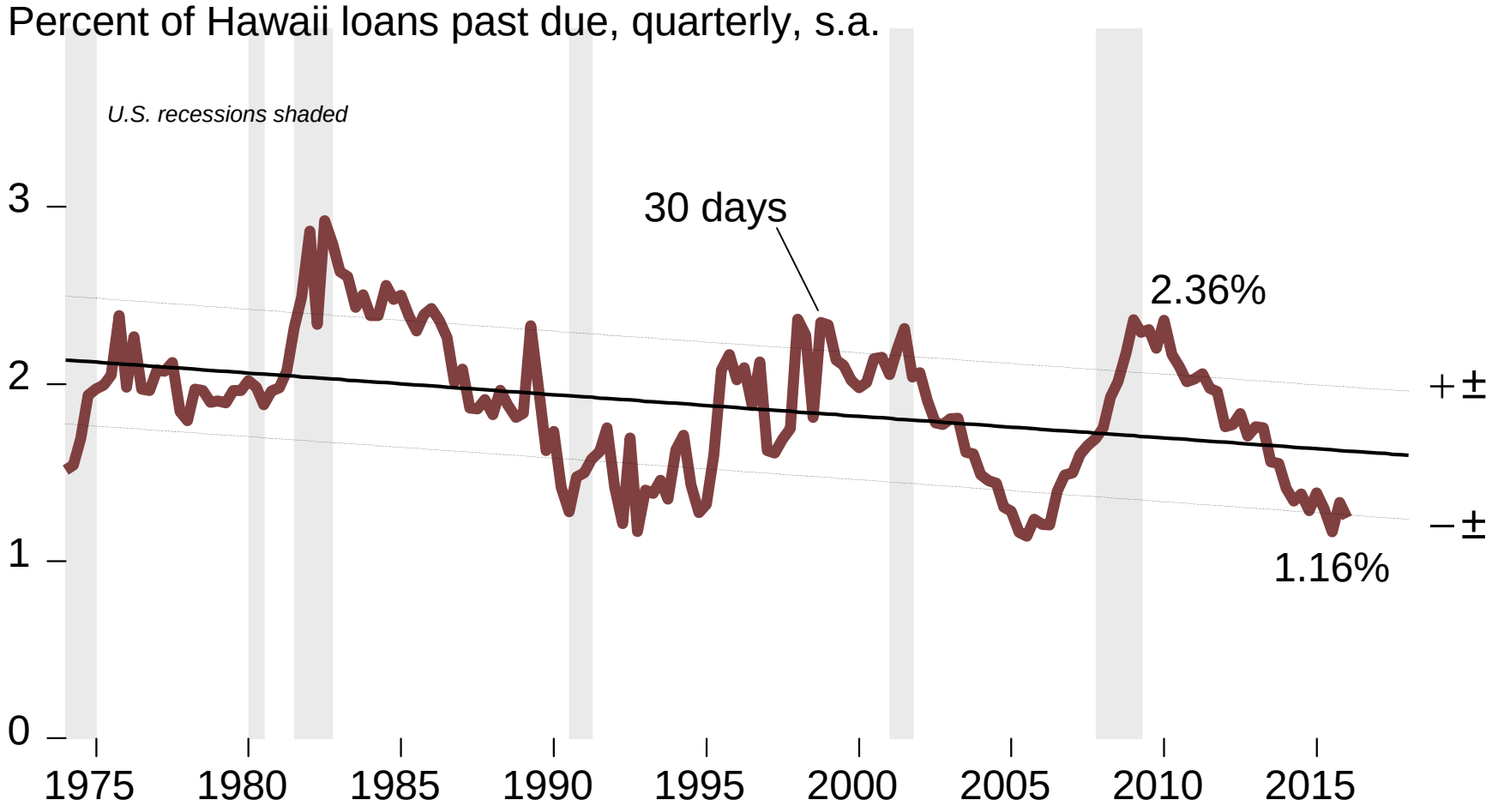
Sources: Federal Reserve Bank of New York based on credit-reporting agency TransUnion LLC's Trend Data database (http://data.newyorkfed.org/creditconditionsmap/)

Bank failure surged during the financial crisis, but better managed based on lessons from prior experiences



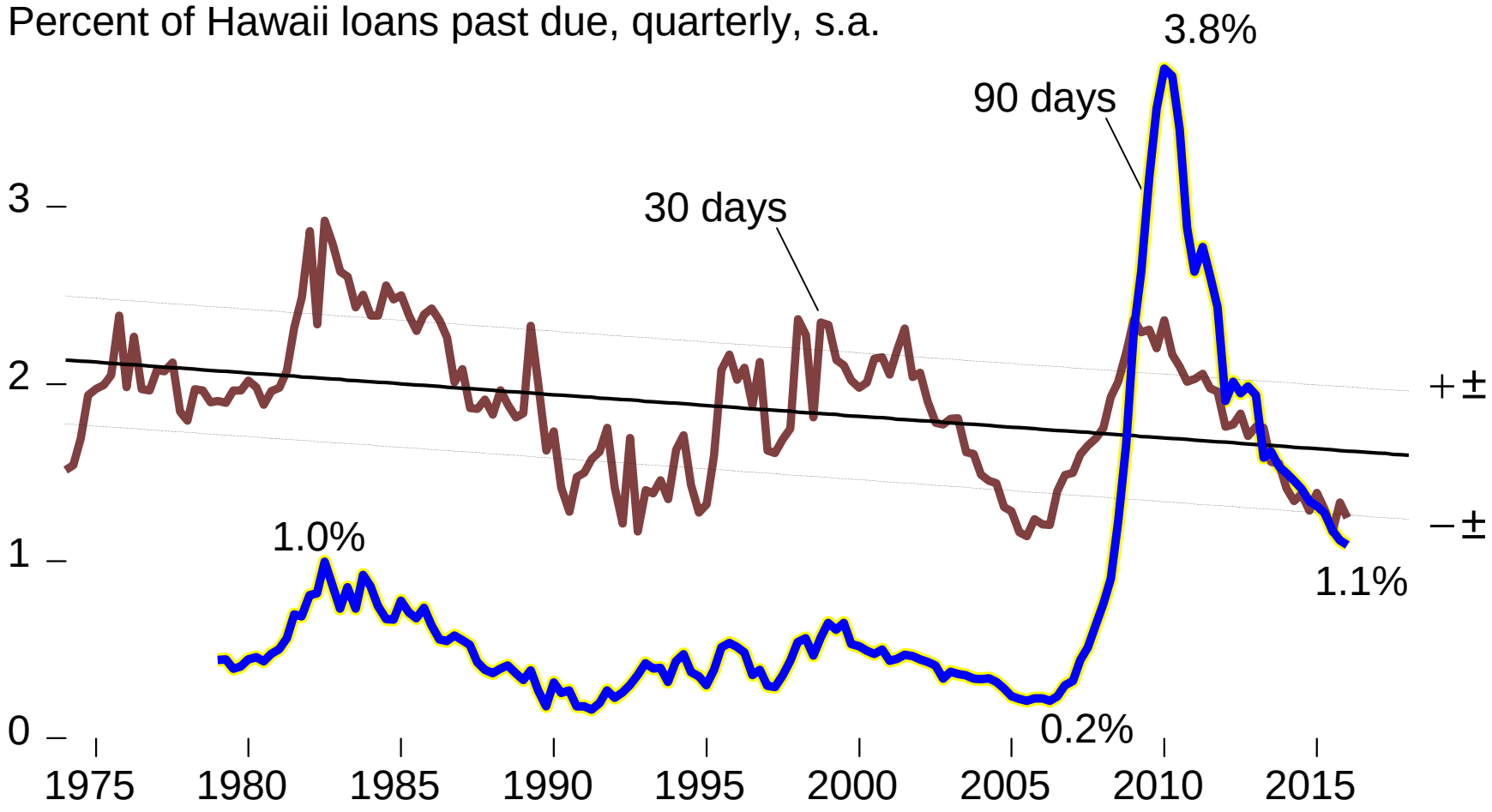
Source: Federal Deposit Insurance Corporation http://www2.fdic.gov/hsob/SelectRpt.asp?EntryTyp=30

Hawaii statewide mortgage delinquency 30 days past due, completing cycle around declining LR trend



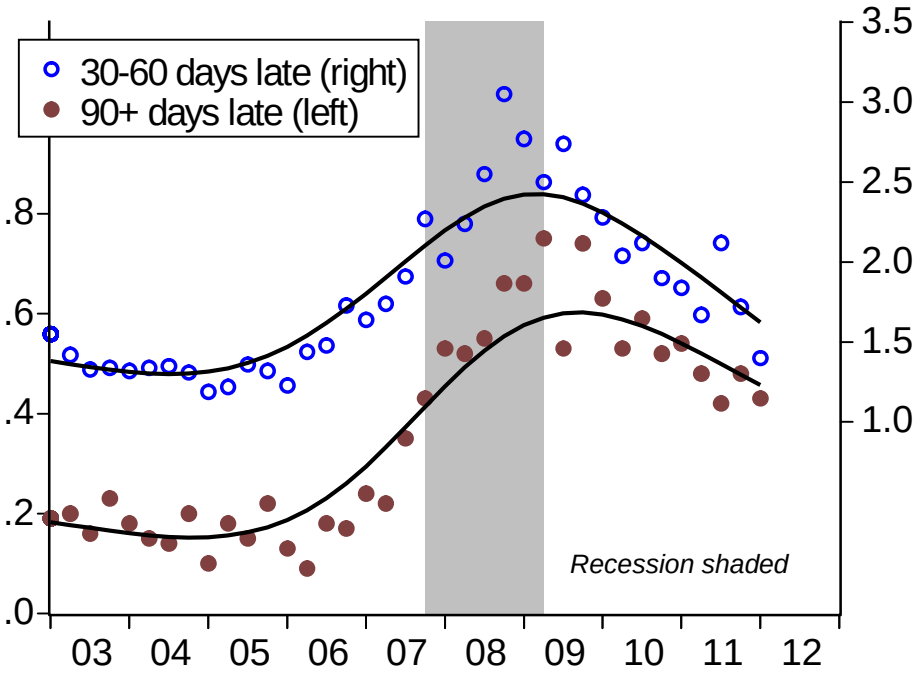
Sources: Mortgage Bankers Association, Guy Sakamoto, Bank of Hawaii, seasonal adjustment and trend regression by TZE

Migration to 90 days past due was a secular event associated specifically with the sub-prime financial crisis

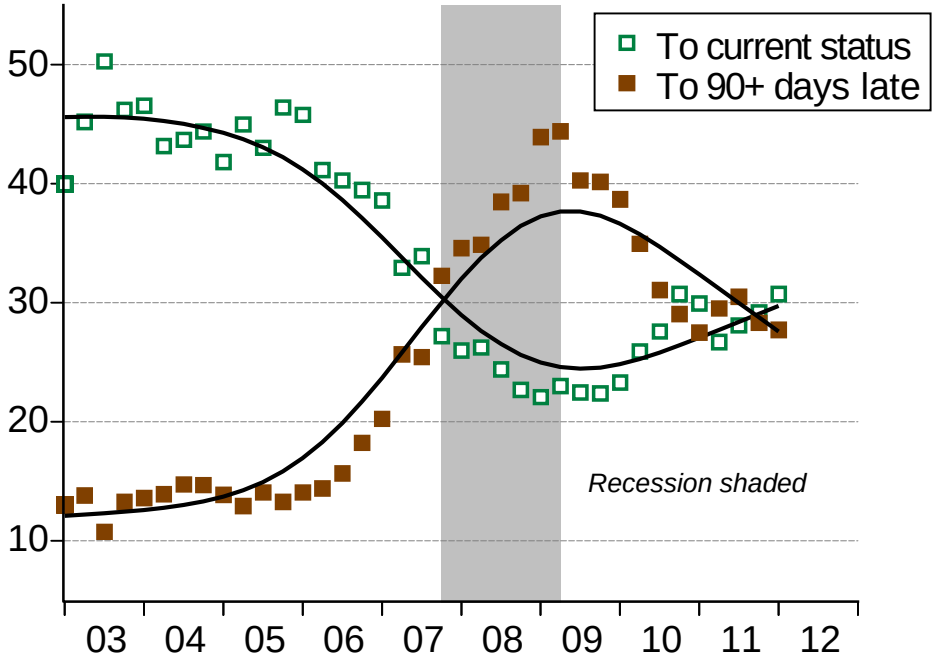


Sources: Mortgage Bankers Association, Guy Sakamoto, Bank of Hawaii, seasonal adjustment and trend regression by TZE

Transition rates for mortgage accounts: after getting worse, getting better with economic recovery



Transition to late status

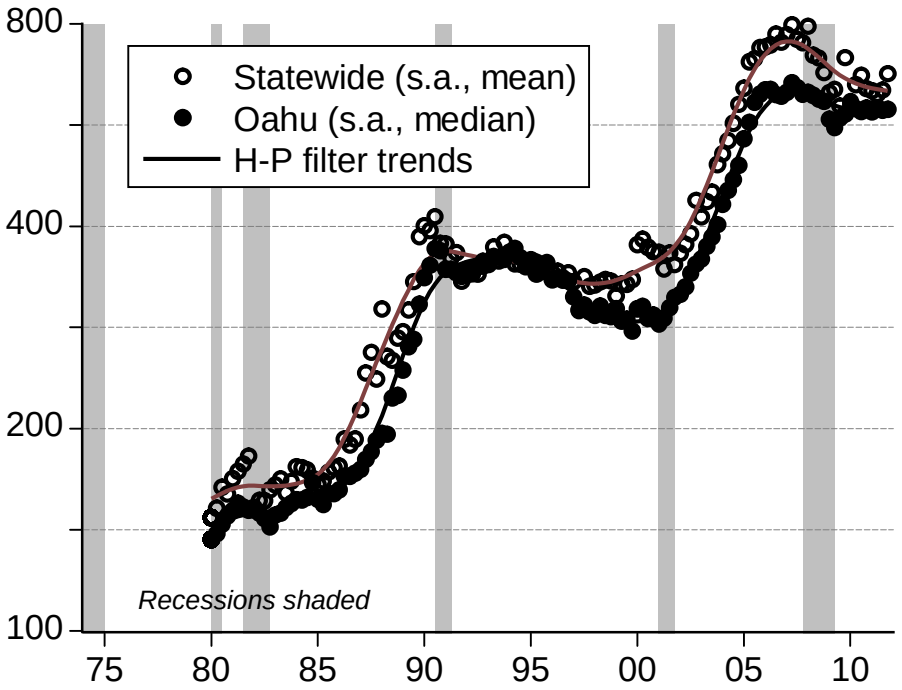


Transitions for 30-60 days late

Source: Federal Reserve Bank of New York (FRBNY Consumer Credit Panel/Equifax)
(http://data.newyorkfed.org/research/national_economy/householdcredit/DistrictReport_Q12012.xls)

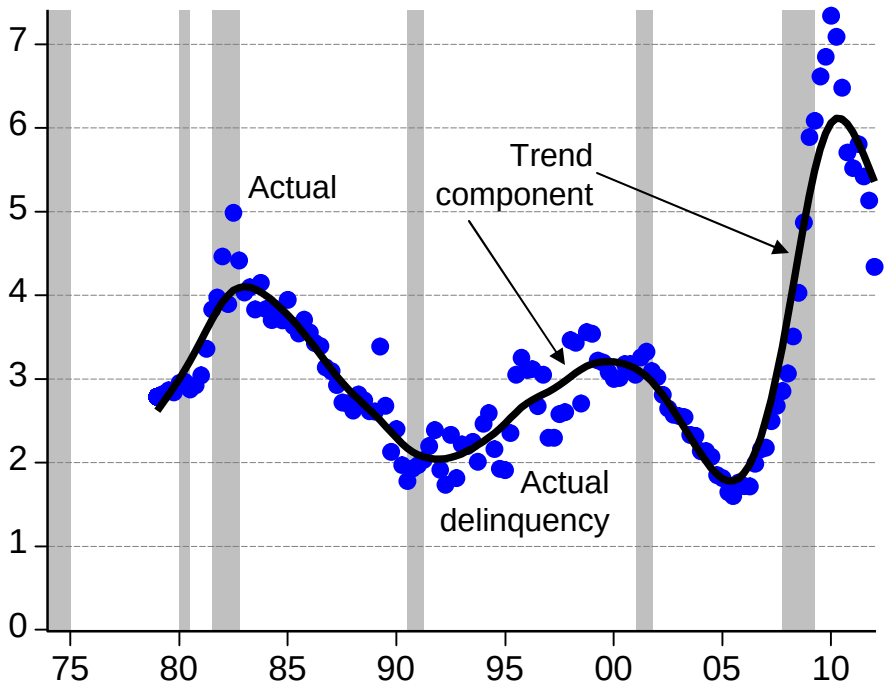
Correlating the valuation cycle to mortgage delinquencies—velocity or acceleration?

Single-family home prices (log scale)



The valuation cycle (home prices)

Percent of loans past due



The delinquency cycle (% past due)

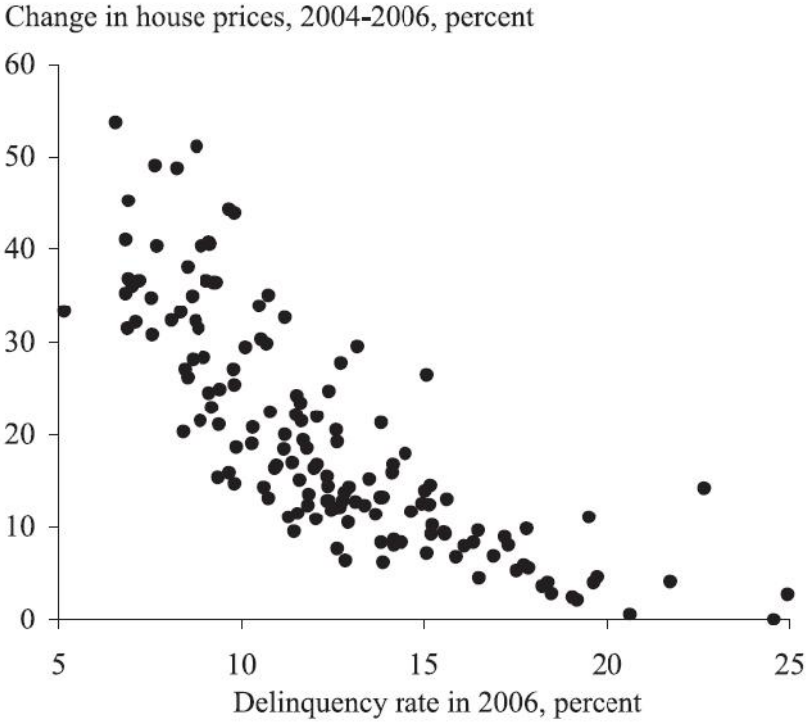
Rates of home price increase, and acceleration, are associated with lower delinquency (inverse relationship)

Sources: Honolulu Board of Realtors, Prudential Locations, UHERO, Mortgage Bankers Association, seasonal adjustment and calculation of Hodrick-Prescott filter trends by TZE; mahalo to Guy Sakamoto, Bank of Hawaii

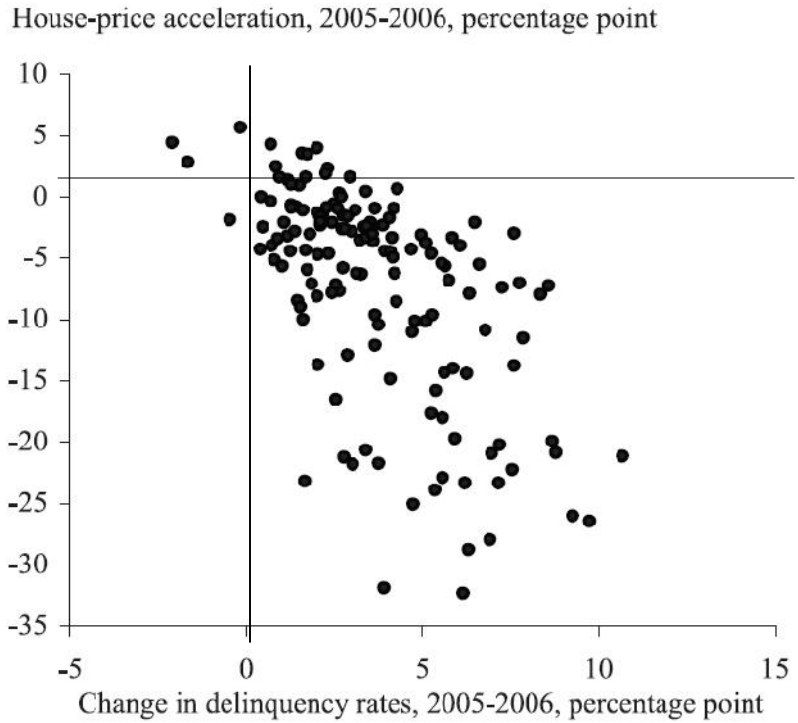
Pre-financial crisis house price movements and subprime mortgage delinquency

Literature at time suggested that high sub-prime delinquency rates were associated with low rates of home price appreciation, and increases in delinquencies were associated with home price *deceleration*.

Changes in house prices and the subprime delinquency rate

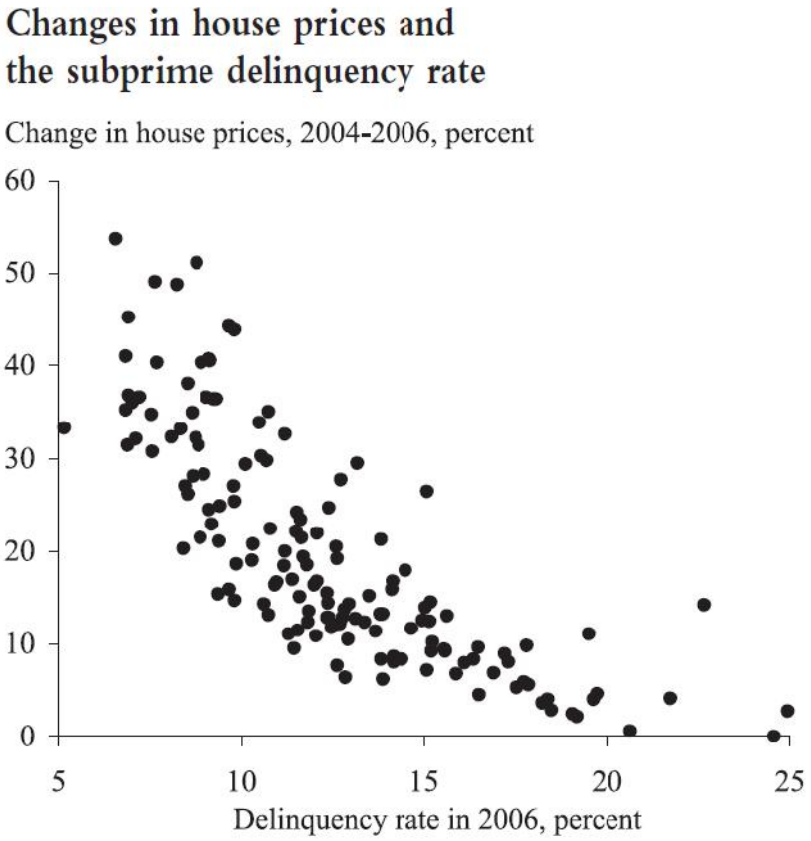


House-price acceleration and changes in subprime delinquency rate

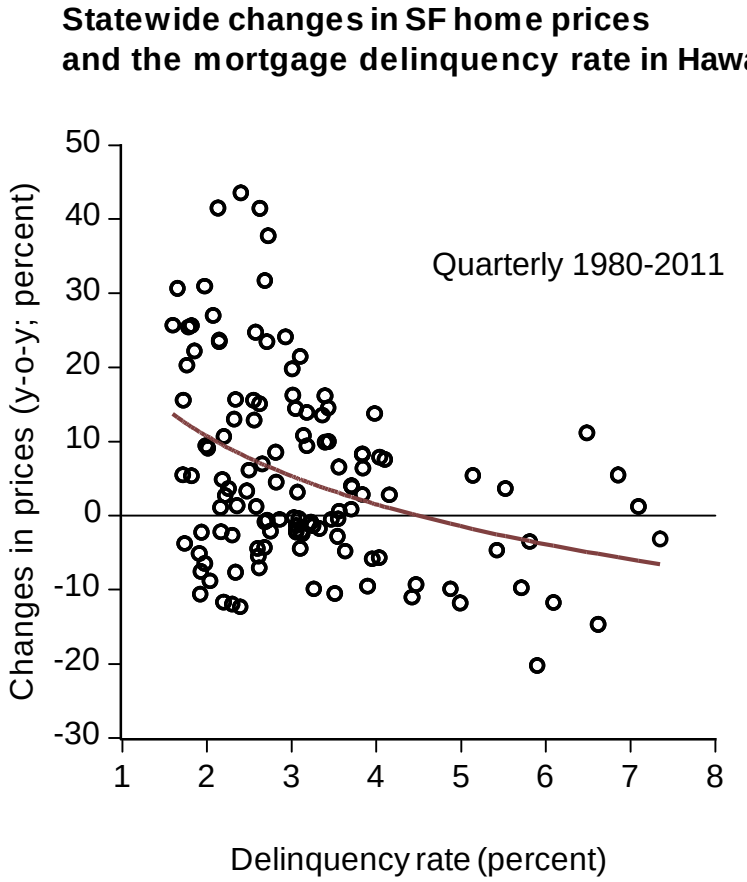


Source: Mark Doms, Frederick Furlong, and John Krainer, "House Prices and Subprime Mortgage Delinquencies," *FRBSF Economic Letter* **2007-14** (June 8, 2007); www.frbsf.org/publications/economics/letter/2007/el2007-14.html

Replicating the FRBSF (2007): inverse relationship Hawaii price appreciation and mortgage delinquency



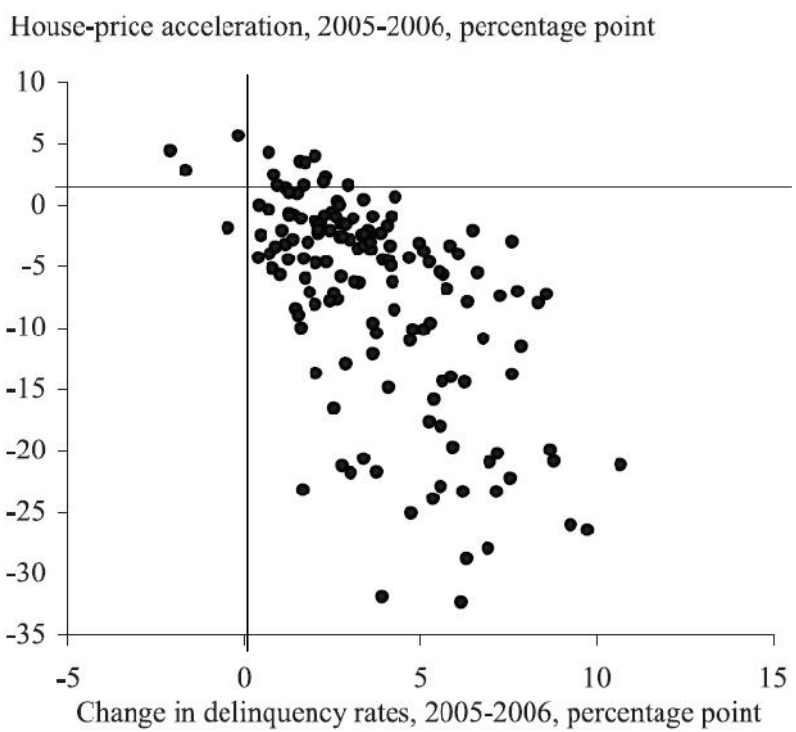
Pre-crisis literature suggested that high sub-prime delinquency rates were associated low rates of home price appreciation, and increases in delinquencies were associated with home price deceleration.



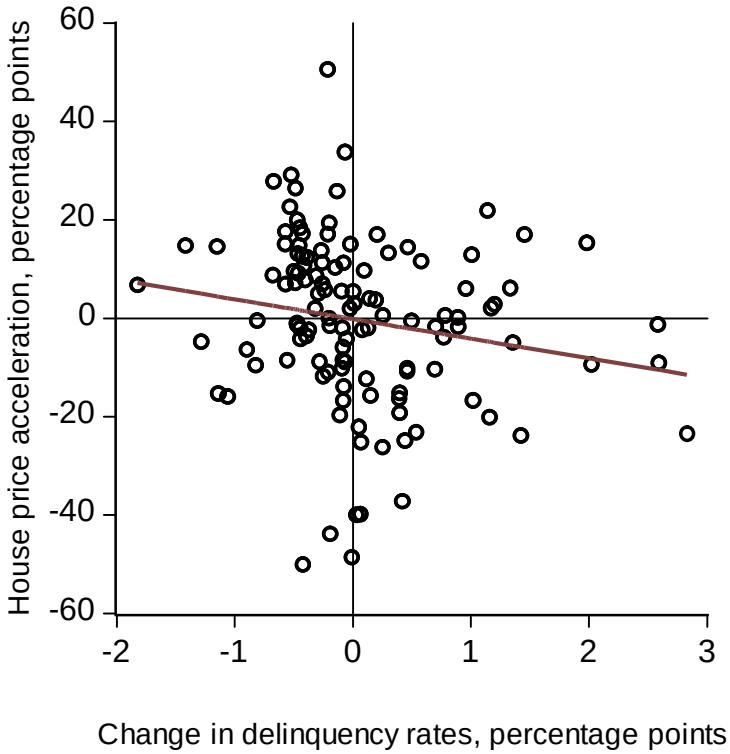
Source: Mark Doms, Frederick Furlong, and John Krainer, "House Prices and Subprime Mortgage Delinquencies," *FRBSF Economic Letter* **2007-14** (June 8, 2007); www.frbsf.org/publications/economics/letter/2007/el2007-14.html; (cont'd appendix), Prudential Locations, UHERO, Mortgage Bankers Association, Guy Sakamoto (Bank of Hawaii); all Hawaii calculations by TZE

Replicating the FRBSF (2007): inverse relationship Hawaii price acceleration and *change* in delinquency

House-price acceleration and changes in subprime delinquency rate

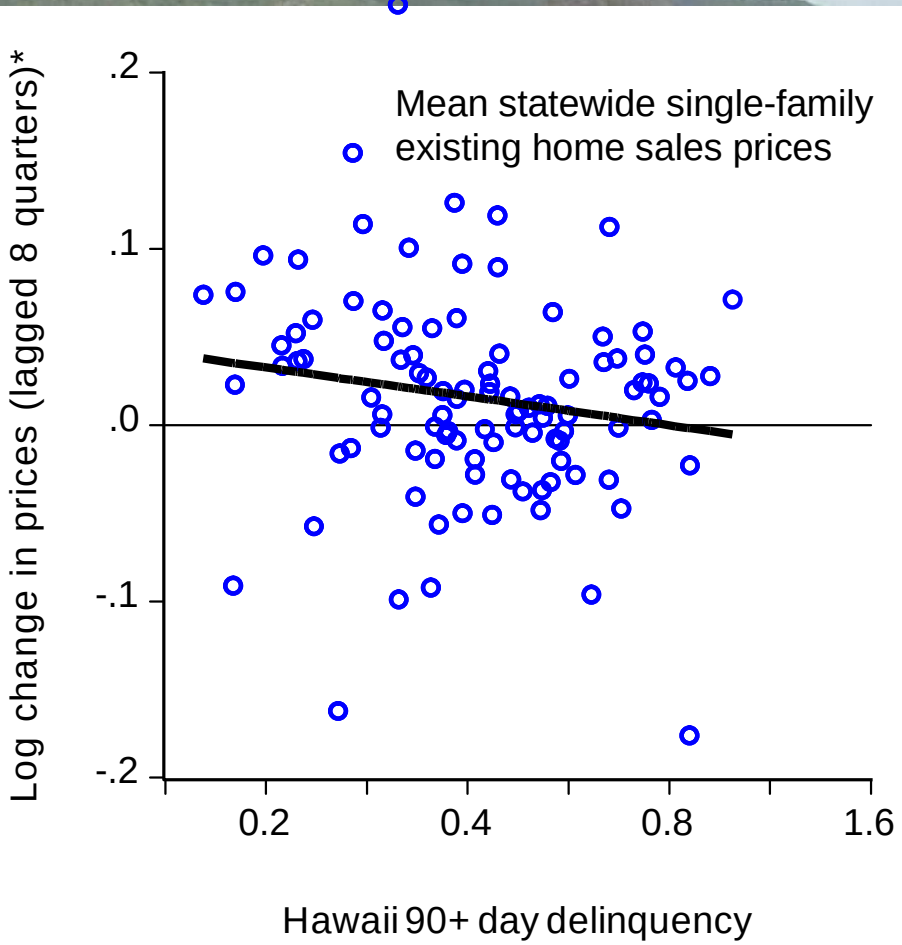


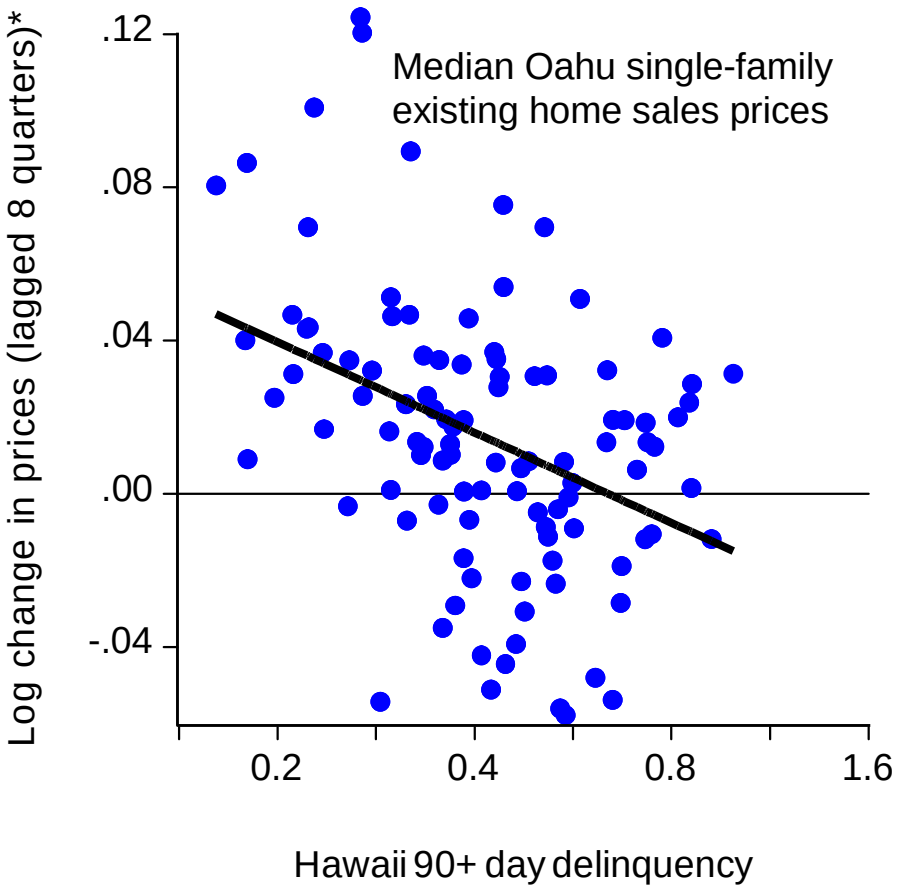
Statewide home price acceleration and changes in mortgage delinquency rates



Source: Mark Doms, Frederick Furlong, and John Krainer, "House Prices and Subprime Mortgage Delinquencies," *FRBSF Economic Letter* **2007-14** (June 8, 2007); www.frbsf.org/publications/economics/letter/2007/el2007-14.html; (cont'd appendix), Prudential Locations, UHERO, Mortgage Bankers Association, Guy Sakamoto (Bank of Hawaii); all Hawaii calculations by TZE

Lagged inverse relationship between mortgage delinquency and home price appreciation in Hawaii

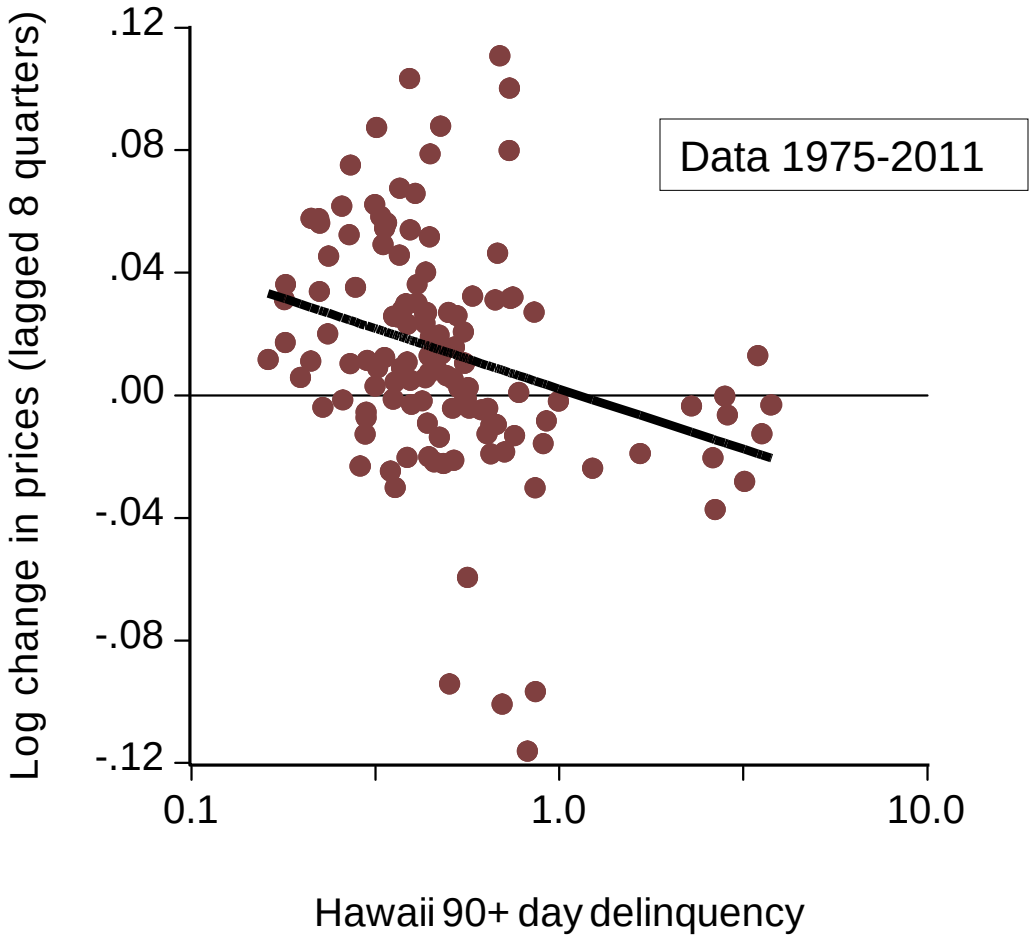




*All data seasonally-adjusted, 1980-2008 (statewide) and 1979-2008 (Oahu)

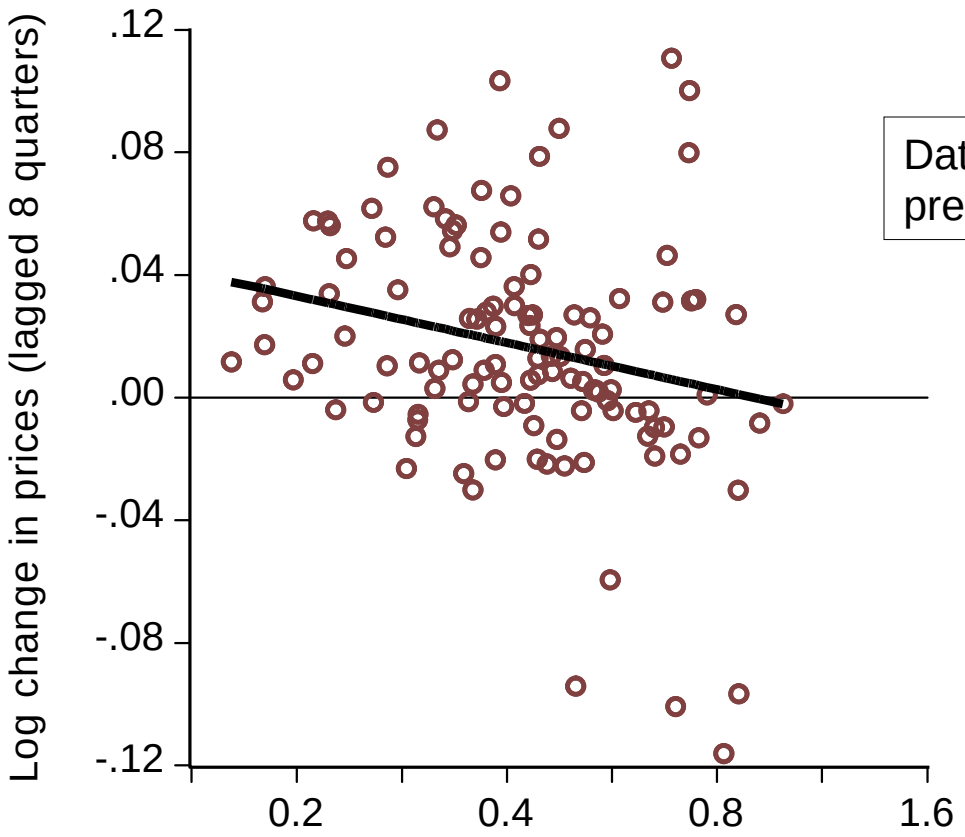
Source: Regressions by TZE; data from Mortgage Bankers Association, UHERO, Prudential Locations, TZE

Lagged inverse relationship between mortgage delinquency and FHFA home price change in Hawaii



Source: Regressions and seasonal adjustment by TZE; data from Mortgage Bankers Association, Federal Housing Finance Authority, TZE

Lagged inverse relationship between mortgage delinquency, FHFA home price change; pre-crisis

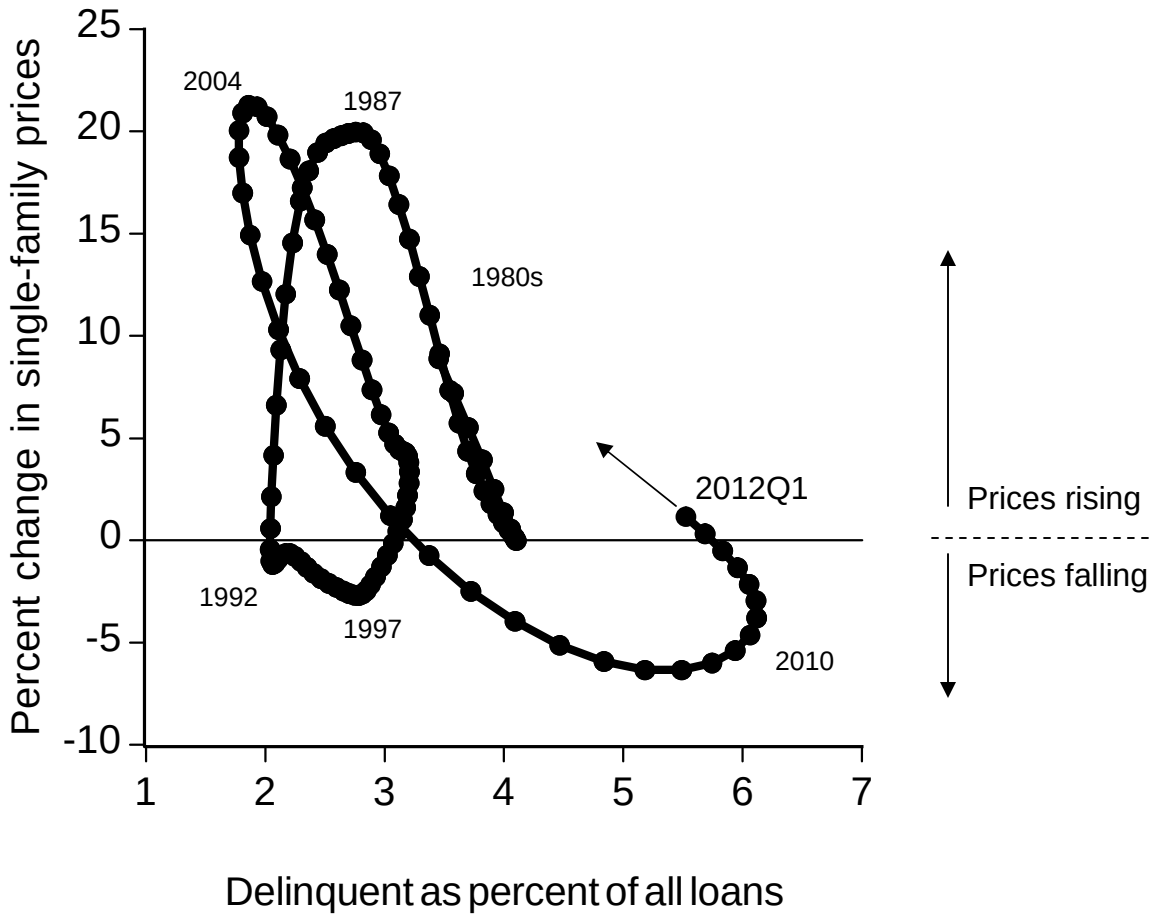


Data 1975-2007; pre-financial crisis

Note that increasing dispersion at higher delinquency (heteroskedasticity) implies that there is a less stable inverse relationship

Source: Regressions and seasonal adjustment by TZE; data from Mortgage Bankers Association, Federal Housing Finance Authority, TZE

Using trend data: the inverse relationship between changes in home prices and delinquency rates appears cyclically in diagonal, flattened orbits

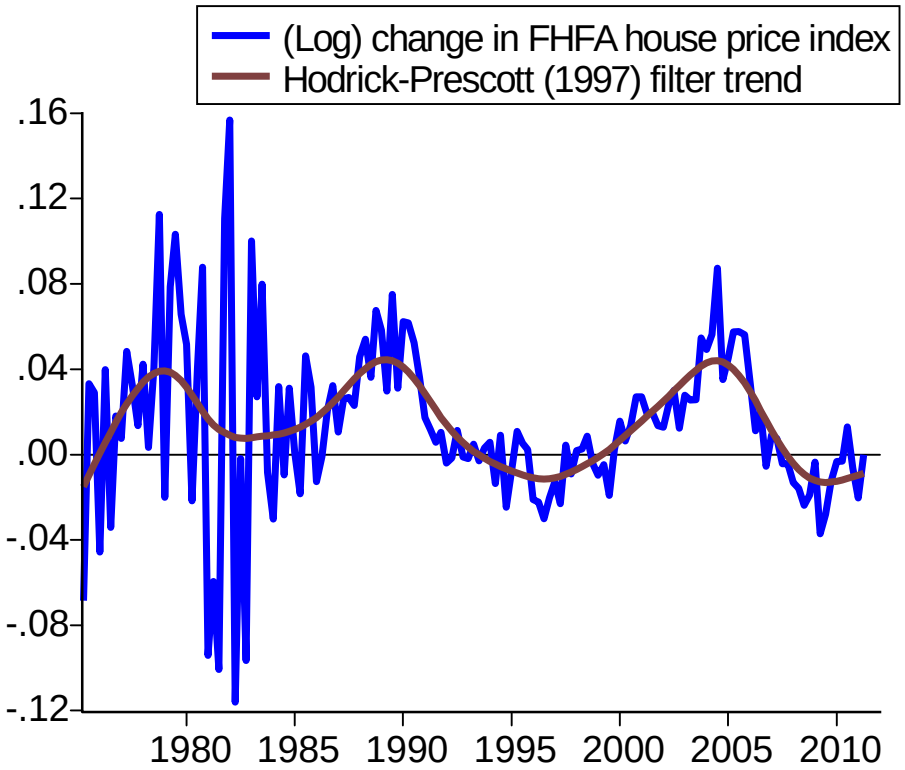


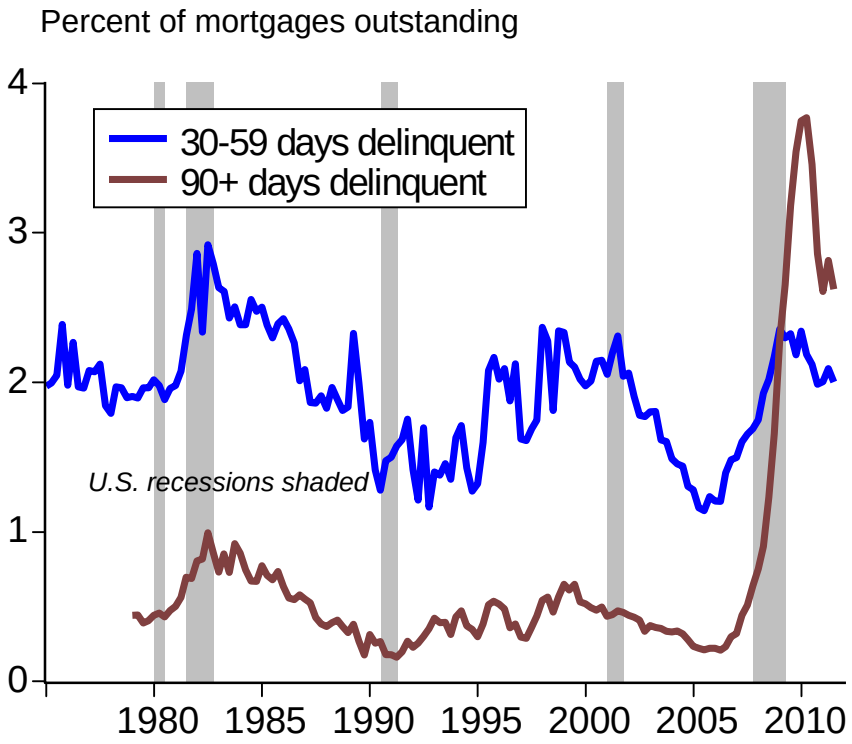
Sources: Prudential Locations, UHERO, Mortgage Bankers Association, Guy Sakamoto (Bank of Hawaii); all calculations by TZE

Reverse the axes, using FHFA prices

- Test of "Granger causality" points to a causal relationship running *from* lagged changes in home prices *to* delinquency levels with a lag of 8 quarters (2 years)
- Let's visualize in the form $y = f(x)$ where x = (log) changes in home prices (lagged eight quarters) and y = delinquency rates (graphed in logarithms) so that the "slope" of each regression is an "elasticity:" relative proportionate responses
- (This *reverses* the axes in the previous graphs, starting with the images taken from Doms and Furlong (FRBSF 2007))
- Working with the FHFA quarterly data set on house prices, taken from mortgage information including sales prices as well as appraisals, back to 1975, extract the "trend component" of the house price time series to dampen the noise introduced by data pre-1985 (as illustrated on the next slide)
- This noise in the early-1980s introduces a statistical problem called "heteroskedasticity" seen in the previous slides, where in the dispersion of the actual data around the regression line changes, moving from left to right
- Make inferences from the extracted *trend* relationship between home price movements (x-axis), 2-year lags, and mortgage delinquency rates (y-axis)

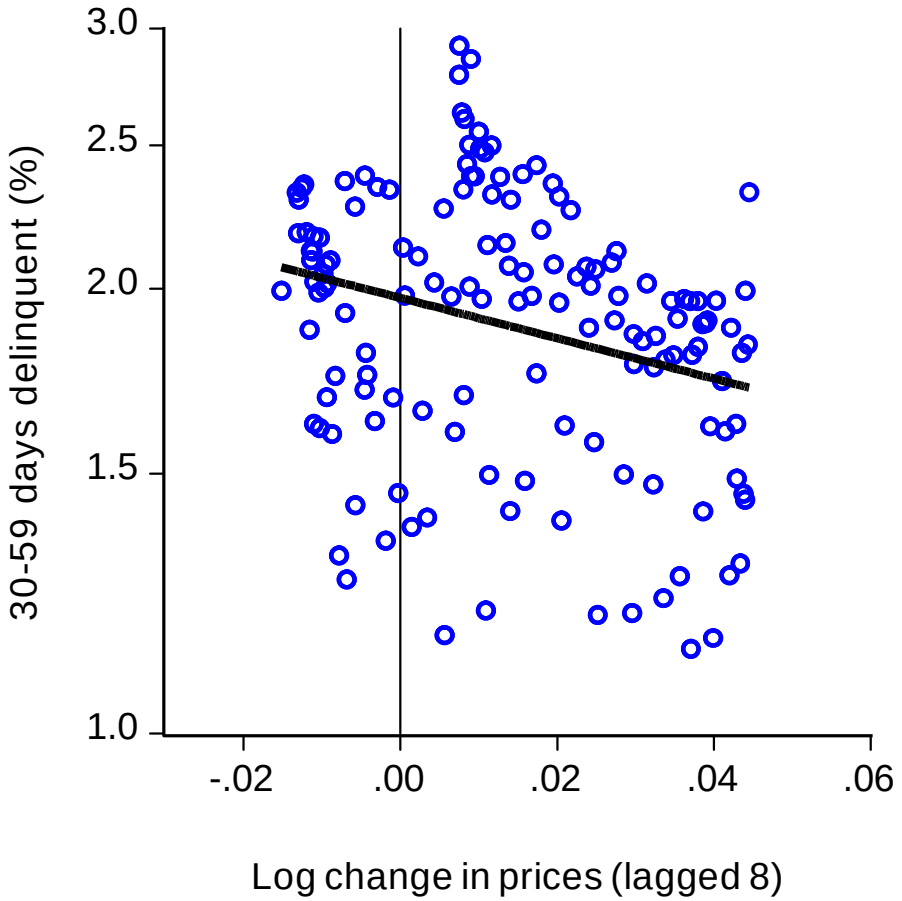
Home price changes (left) and delinquency (right)

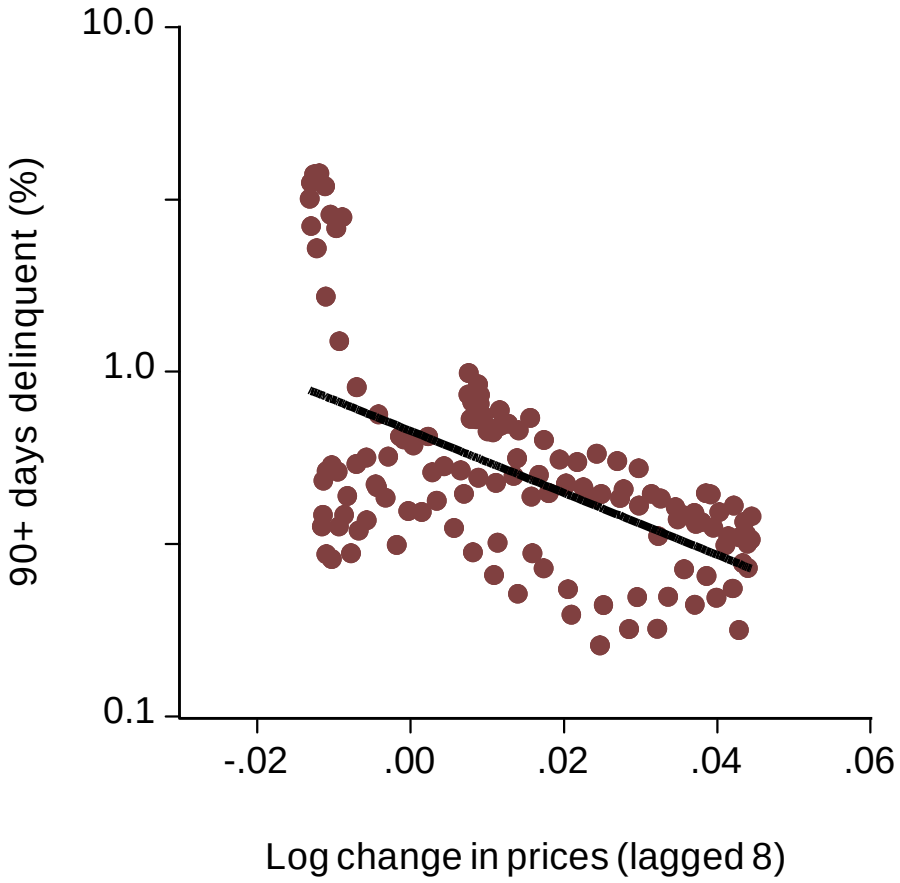




Source: Regressions and seasonal adjustment by TZE; data from Mortgage Bankers Association, Federal Housing Finance Authority, TZE

Lagged inverse relationship between FHFA home price change *trend* and mortgage delinquency in HI





Source: Regressions and seasonal adjustment by TZE; data from Mortgage Bankers Association, Federal Housing Finance Authority, TZE

Toxicity: learning from mortgage delinquency

- The Great Recession, concluding the sub-prime mortgage lending-driven housing "bubble" that preceded it:
  1. Wide geographic variation in mortgage delinquency
  2. Notable for anomalous spike in *serious* delinquency
- *Correlated* house price declines across different regions of the economy, and correlated increases in mortgage delinquency, meant that the benefits of geographic diversification to mortgage pools (portfolio risk reduction) was actually reversed: correlated movement led to a *contagion* event
- Unwinding of house price bubbles in active regional markets (Las Vegas, Phoenix, Central California, Florida) radiated outward spatially and through the financial system as a contagion—price declines, increased delinquency, higher mortgage default, impaired values for mortgage-backed securities, collateralized debt obligations (built from MBS), credit default swaps (CDS counterparty risk)
- Fire sales externality: selling assets to raise cash pushes down asset values, leading others also to sell to raise cash, exacerbating valuation declines

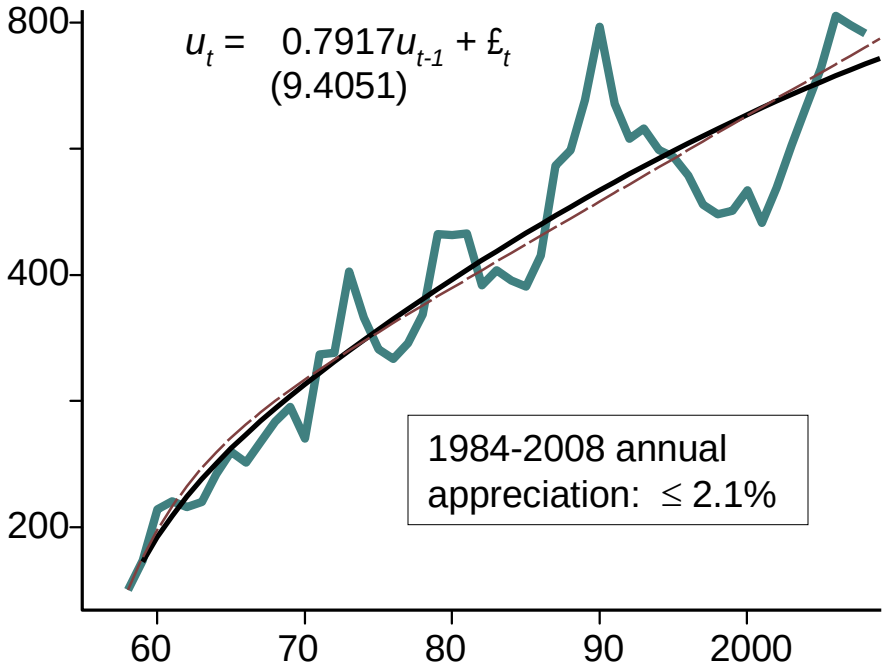
Digging deeper into linkages: house price movements and changes in delinquency

- Rising prices are associated with falling delinquencies (up to lags, etc.)
- In cyclical markets, rising phase of house price cycle has similar inverse relationship with falling phase of mortgage delinquency cycle (up to lags)
- Some evidence that price *deceleration* raises the *pace of increase* in delinquency (i.e. prices rising *at a decreasing rate of increase* can precede, precipitate a delinquency rise)
- Complex nonlinearity actually masks underlying orbit—embedding inverse relationship—in delinquency-price change space
- Evidence now clearly shows incipient improvement—higher house prices, lower delinquencies for some time to come is the indication of current momentum

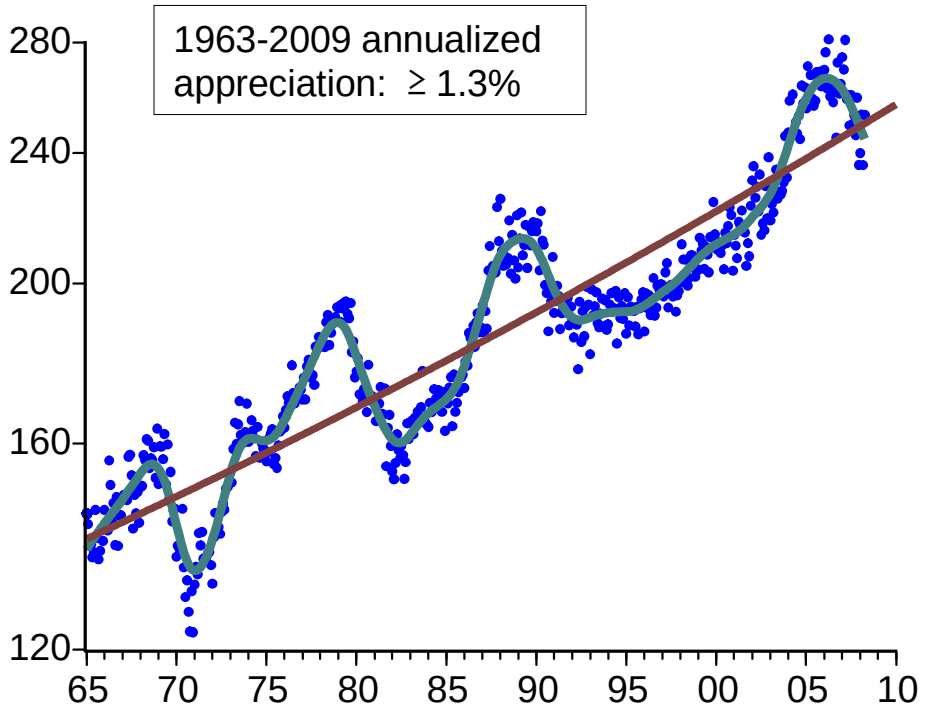
Adjusted for inflation: asset-pricing bubbles? or garden-variety valuation cycles?

$$\ln(P_t^H) = \underset{(32.3522)}{5.3701} + \underset{(5.0935)}{0.0235}t + u_t$$

$$u_t = \underset{(9.4051)}{0.7917}u_{t-1} + £_t$$



Mean Oahu real *existing* SF home prices



Median U.S. real *new* SF home prices

Source: TZ Economics; deflation using the Honolulu and U.S. All-City CPI-U; thousand 2007 dollars, log scales

Regression of Oahu single-family median existing home prices on payroll employment (and lags): popular correlation with jobs not adequate

LOG(P) = -13.44718509 +
2.115735061*LOG(JOBC (-1)) +
0.1813978443*LOG(JOBC(-2)) +
0.2386012886*LOG(JOBC (-3)) +
5.263170009*LOG(HCPIU(-1)) +
0.071227734*LOG(HCPIU(-2)) -
4.55245973*LOG(HCPIU(-3))

Residual cycle (difference between actual and fitted values is highly autocorrelated) broadly consistent with macro cycles—early-80s recovery, late-80s Japan Bubble, late-1990s economic stagnation (as in the title of your textbook by Chris Grandy, *Hawaii Becalmed*), early-2000s Subprime Bubble (microeconomic adverse selection/moral hazard event), the Great Recession (Dec. 2007 – Jun. 2009), early 20-teens turbulence (so-called "double-dip" discussed in section on overshooting and oscillation); data through early-2012