

A satellite-style image of the Earth showing the Pacific Ocean on the left and the western coast of North America on the right. The ocean is a deep blue, and the land is a mix of green and brown. The title 'Aspects of the Great Recession' is overlaid in yellow text on the ocean.

# Aspects of the Great Recession

*Prepared for the  
Realtors Association of Maui  
King Kamehameha Golf Club, July 17, 2009*

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Research Fellow, UHERO  
and Senior Economic Advisor, Bank of Hawaii*

Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image © 2009 DigitalGlobe  
Image © 2009 TerraMetrics

44°40'46.39" N 136°52'57.55" W elev -13737 ft

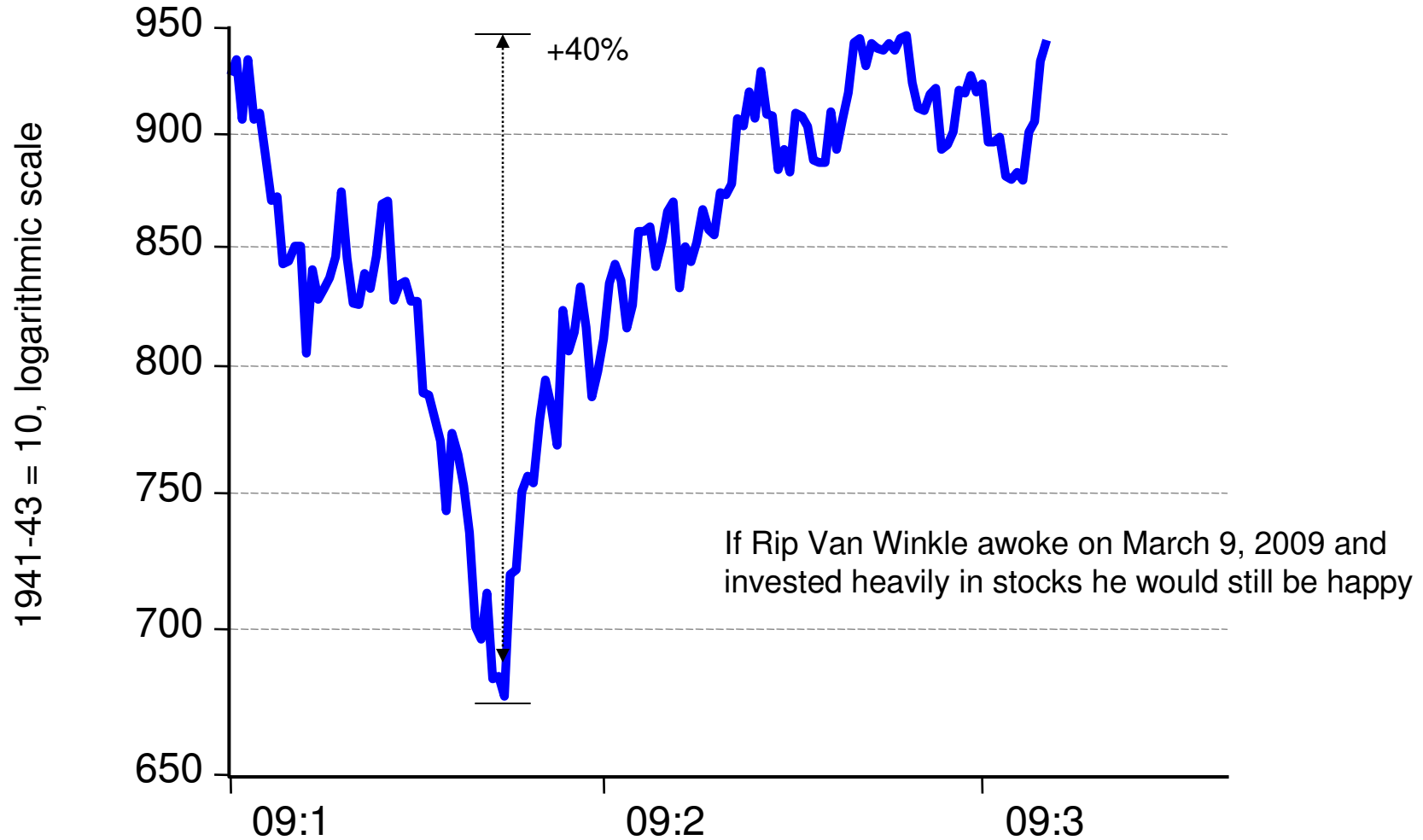
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Eye



# Introduction

# Green Shoots vs. Lawn Mower: Standard & Poor's 500 Index

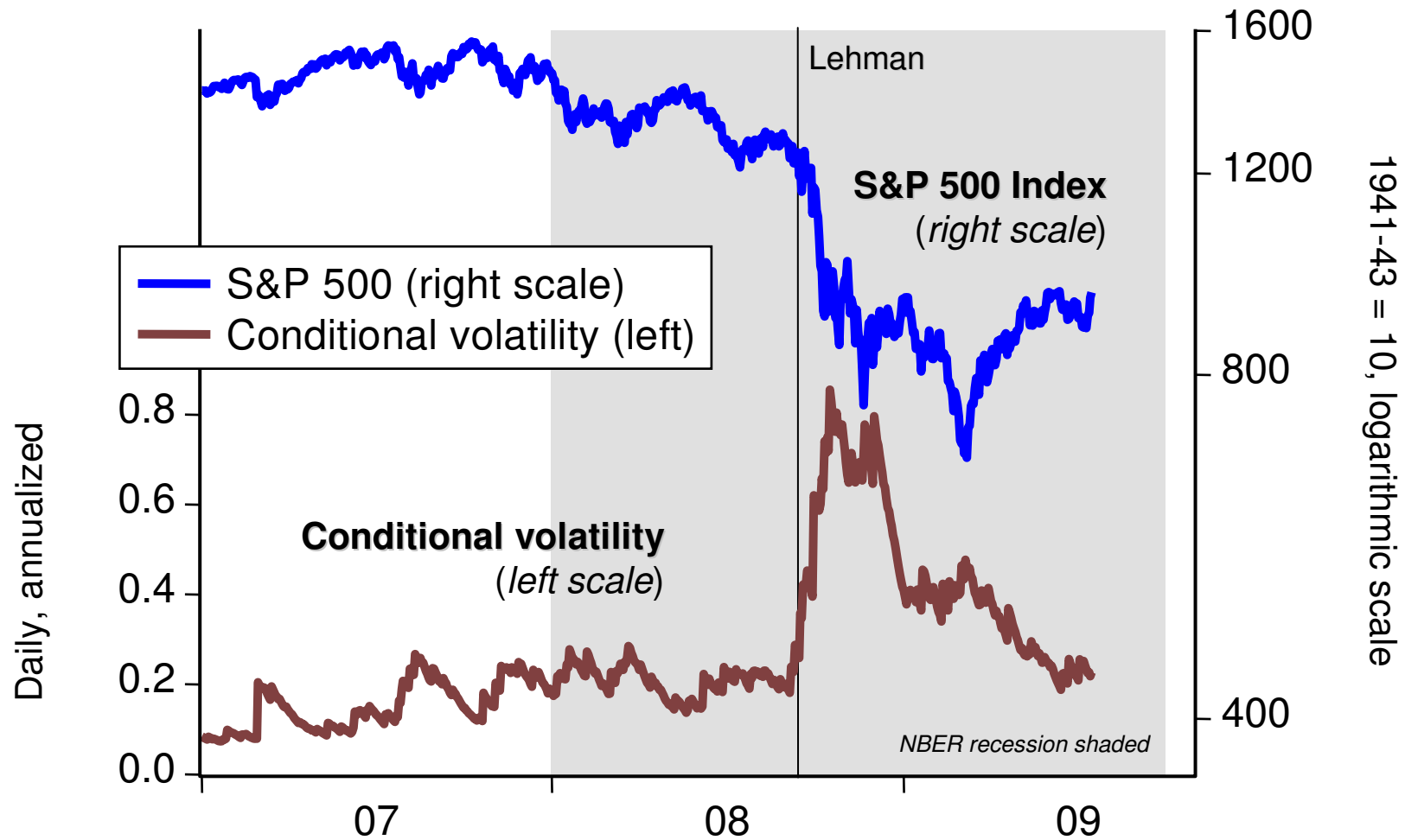


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Source: Standard & Poor's, E-trade; through July 16, 2009



# Equity valuations may have found a bottom



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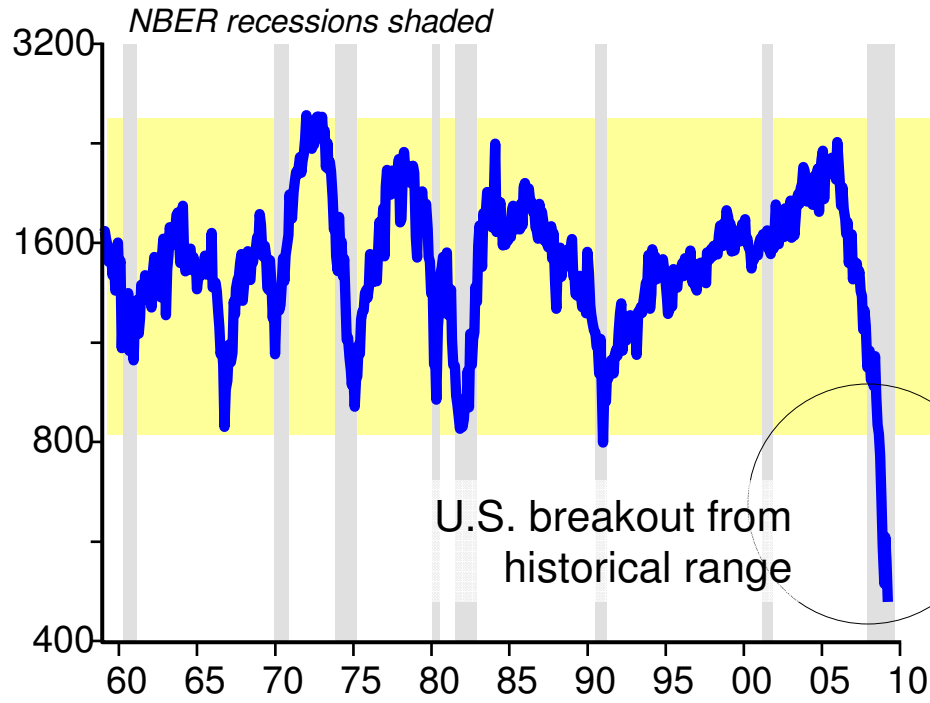
Source: Standard & Poor's, E-trade; Threshold autoregressive conditional heteroskedasticity conditional standard deviations through July 16, 2009 calculated by TZE



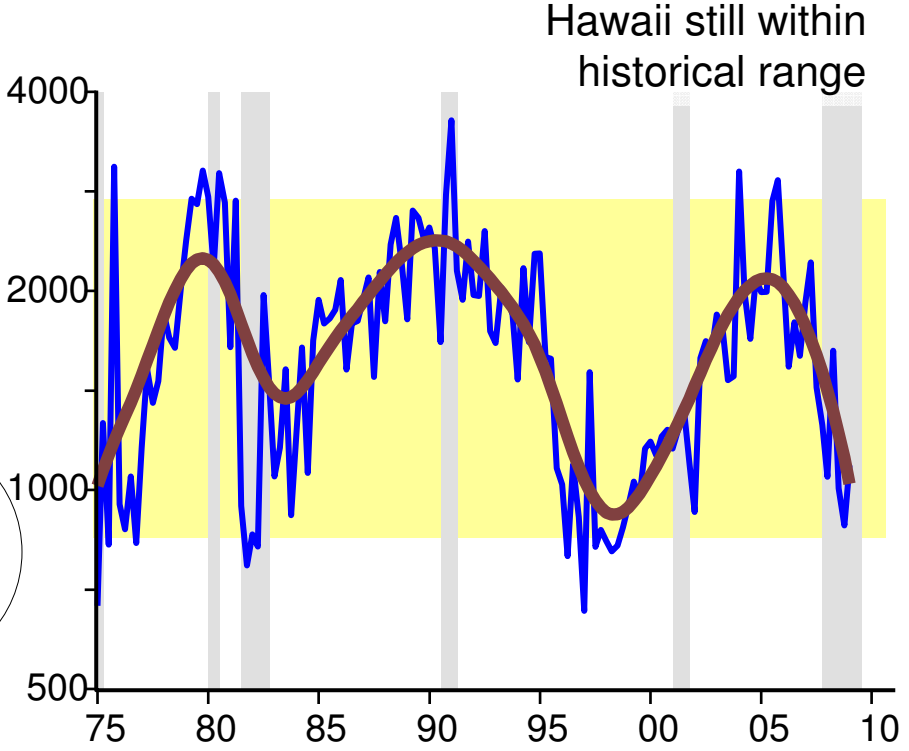
## Backdrop: financial crisis

- Financial crisis rooted in residential investment cycle
- Typical excesses in bubblicious part of cycle—at the peak
- This time: synchronicity is notable distinction from past
- Toxicity amplified by *correlated* default
- Investors traded diversifiable risk for systemic risk
- Consumer capitulation accompanied collapse of Lehman
- Intensification of financial crisis brought system to the brink
- Massive monetary, fiscal backstopping forestall sudden death
- Stabilization precedes recovery

# Collapse in residential investment

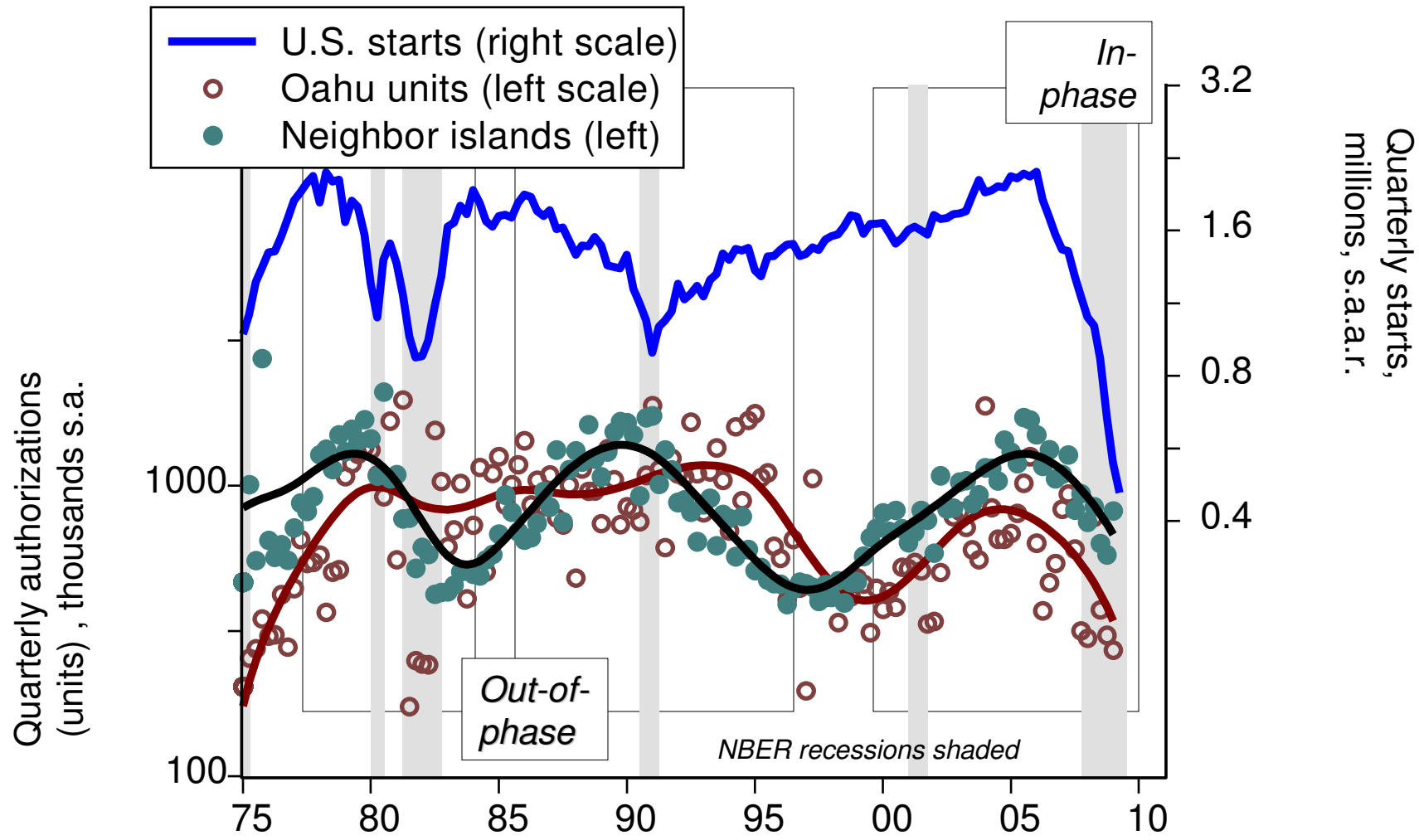


U.S. housing starts  
(monthly, million units, s.a.a.r.)



Hawaii housing authorizations  
(quarterly units, s.a.)

# New home construction cycle



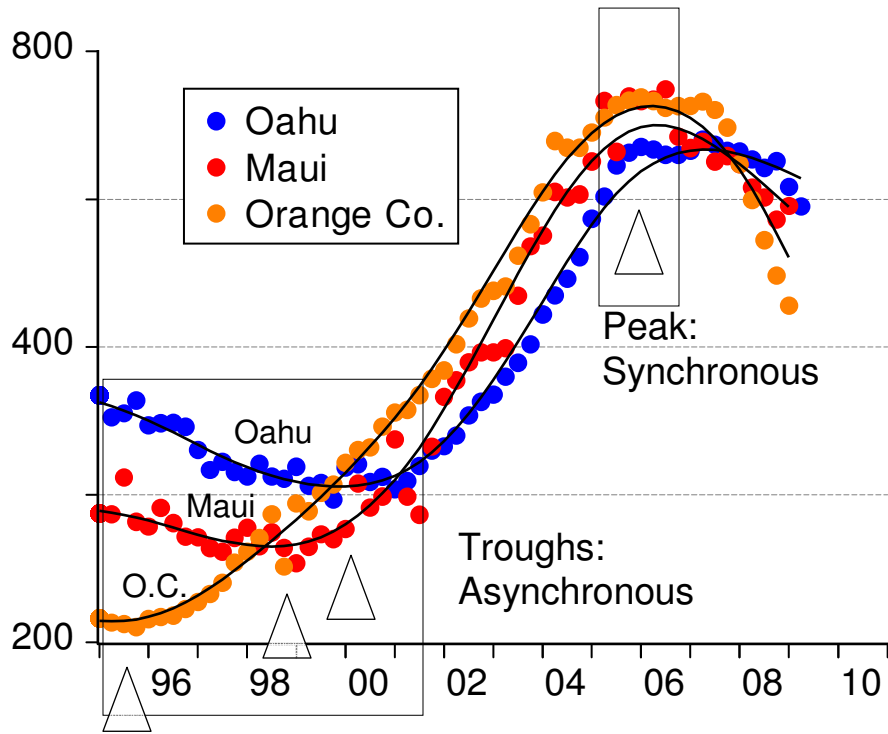
Slide copyright TZ Economics

Sources: Federal Reserve Bank of St. Louis, Bank of Hawaii, Hawaii DBEDT; calculations by author

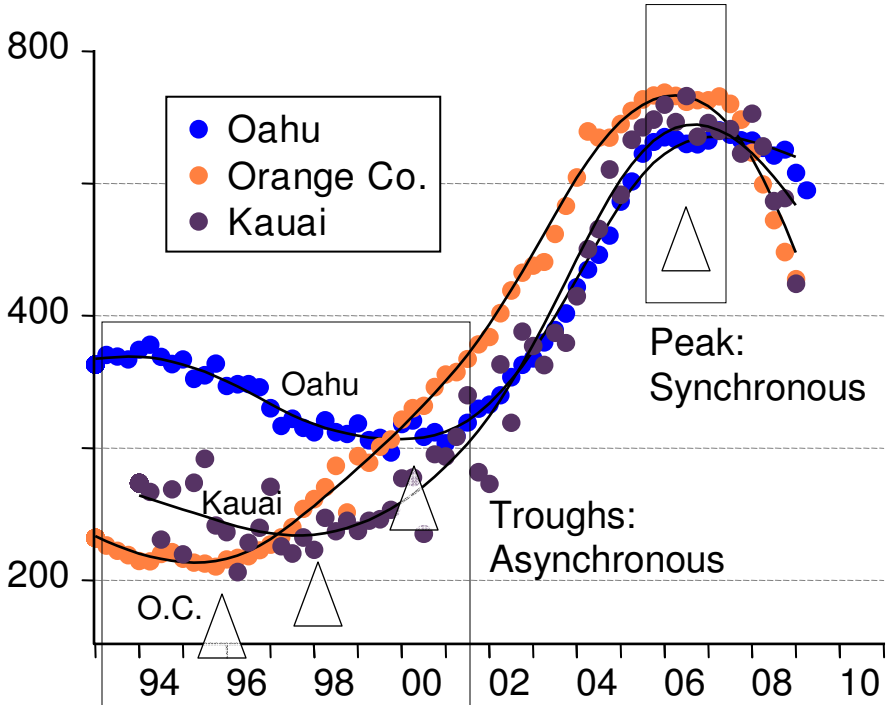


# Median home price movements synchronous

Quarterly s.a.,  
thousand dollars

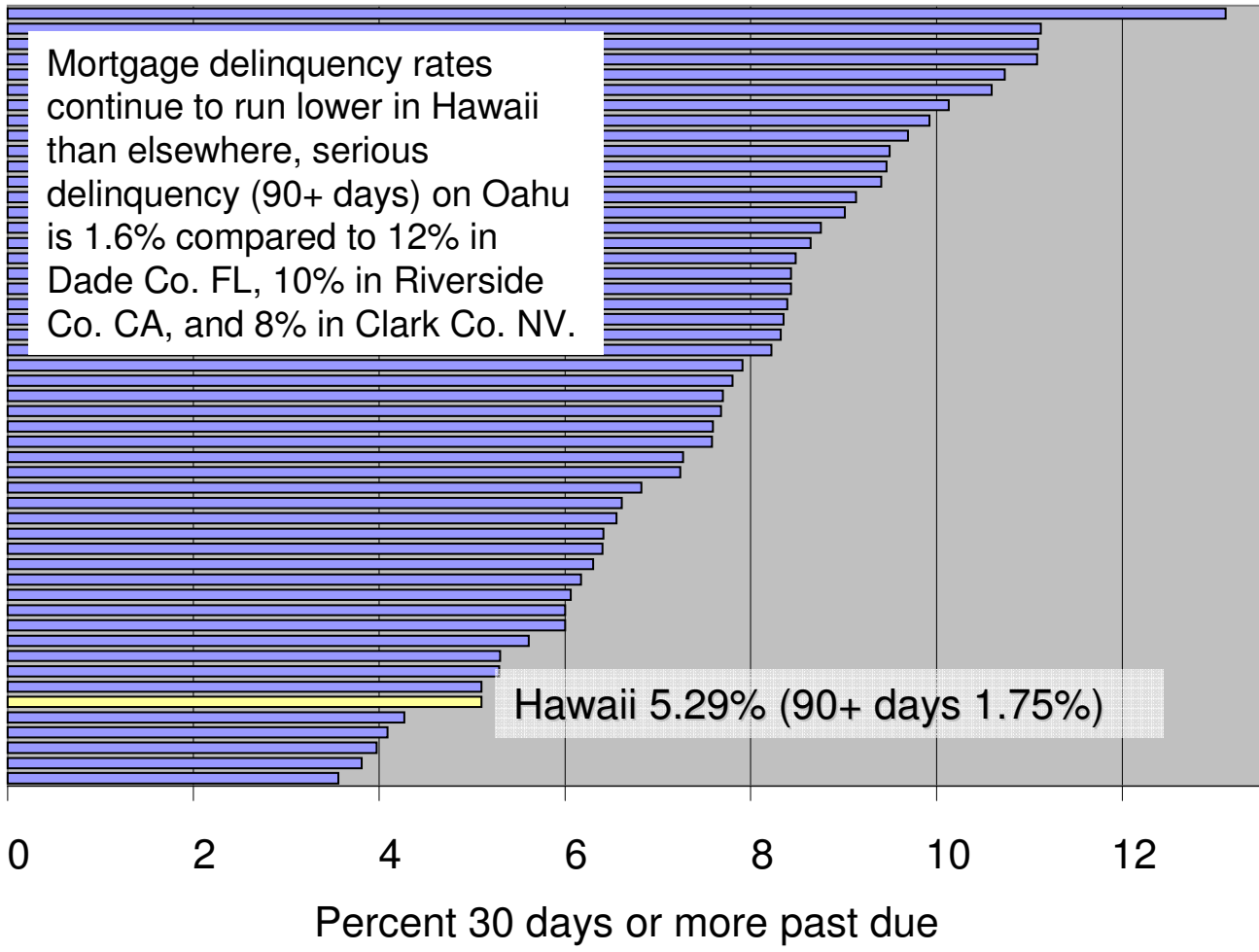


Comparing Maui



Comparing Kauai

# Mortgage delinquency lower in Hawaii



1 Mississippi	13.11
2 Nevada	11.12
3 Florida	11.09
4 Michigan	11.08
5 Georgia	10.73
6 Indiana	10.59
7 Louisiana	10.13
8 Tennessee	9.92
9 Alabama	9.69
10 Ohio	9.49
11 Arizona	9.46
12 West Virginia	9.40
13 California	9.13
14 Texas	9.01
15 Rhode Island	8.75

# Serious mortgage delinquency

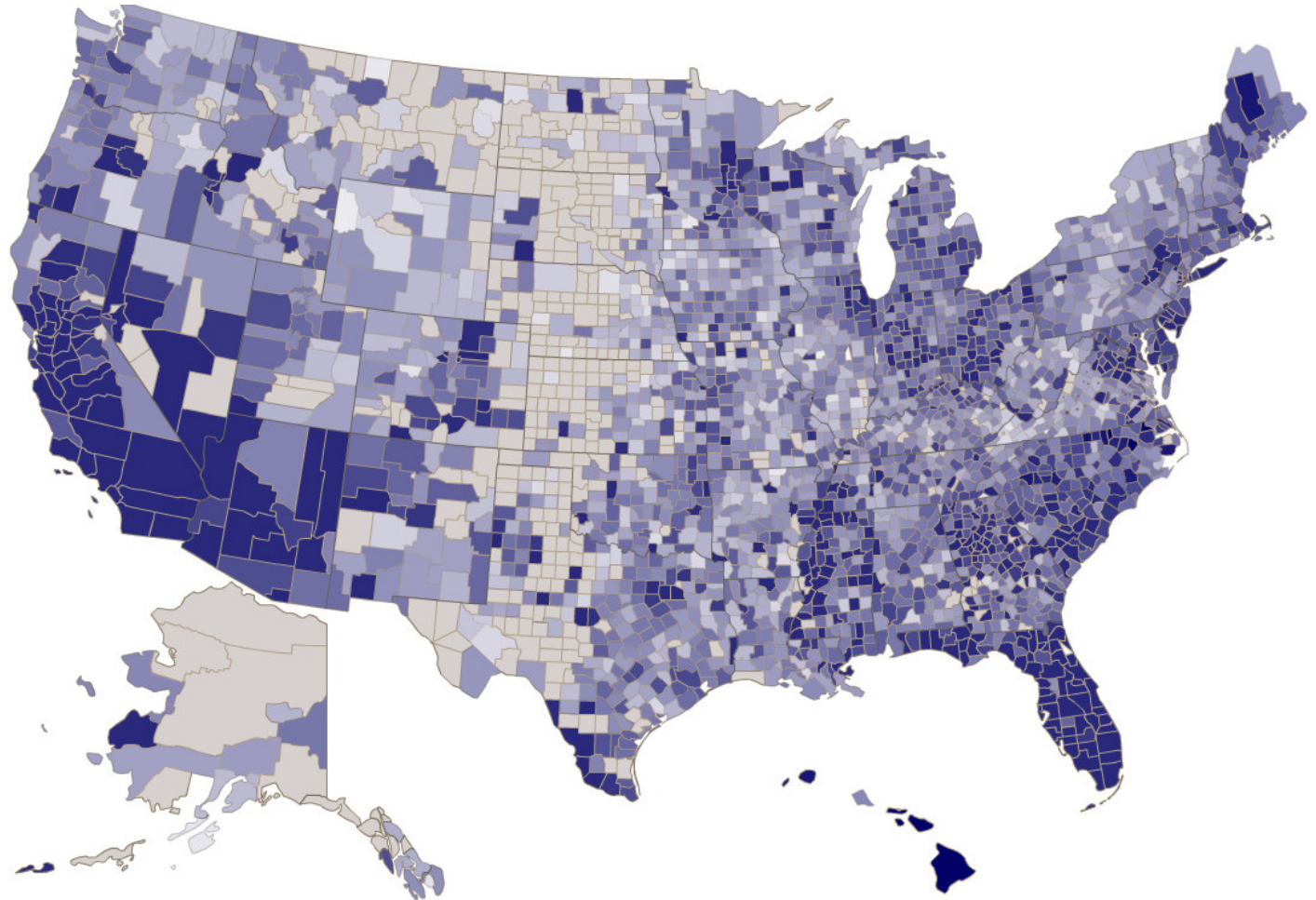
Selected Counties:  
(percent of loans)

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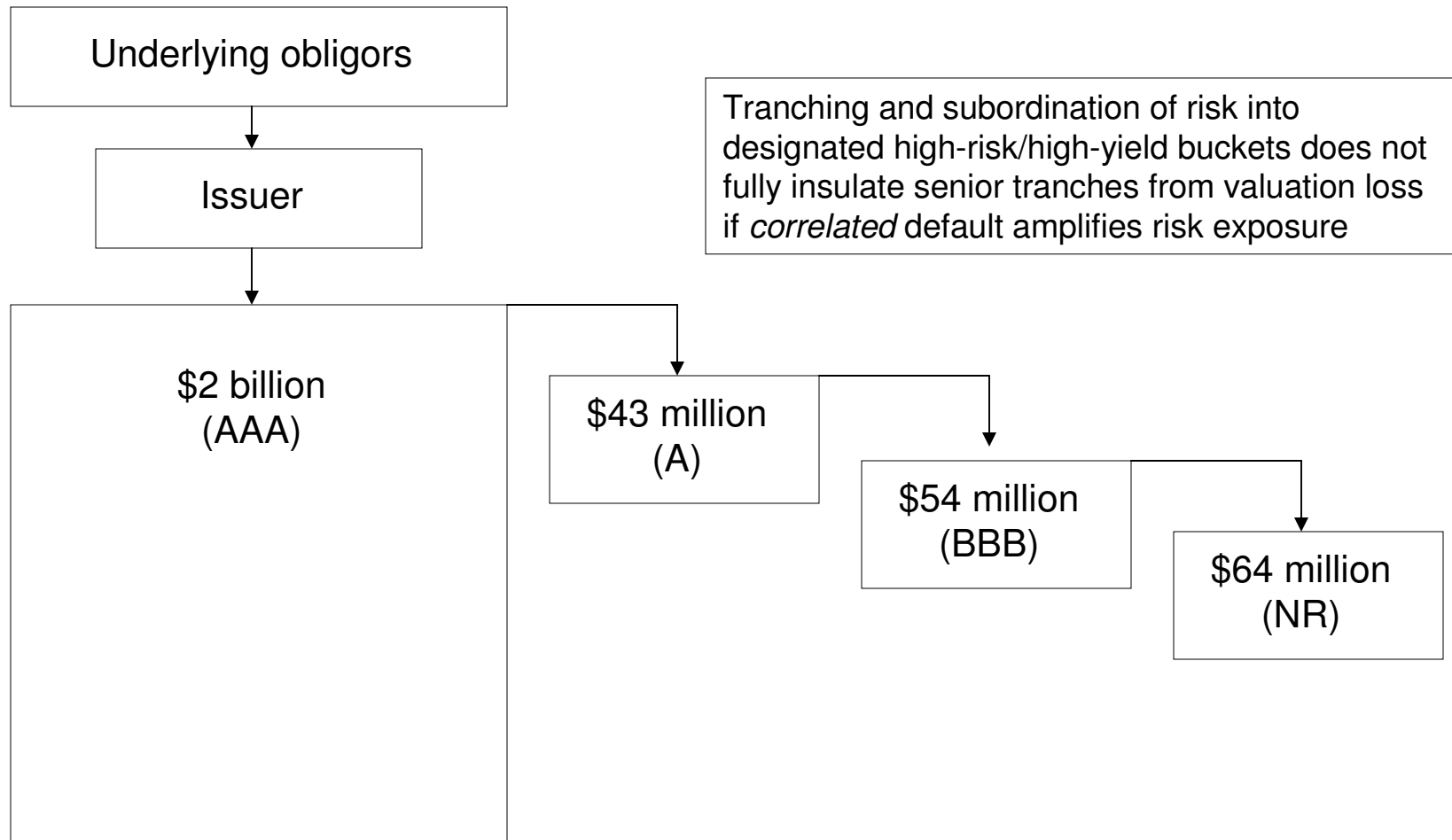
Dade, FL	15.45
Merced, CA	12.90
Clark, NV	10.93
Maui, HI	4.69
Hawaii, HI	4.50
Kauai, HI	4.01
Honolulu, HI	2.07

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Resilient Oahu home prices reflect underlying economic fundamentals, not imminent collapse

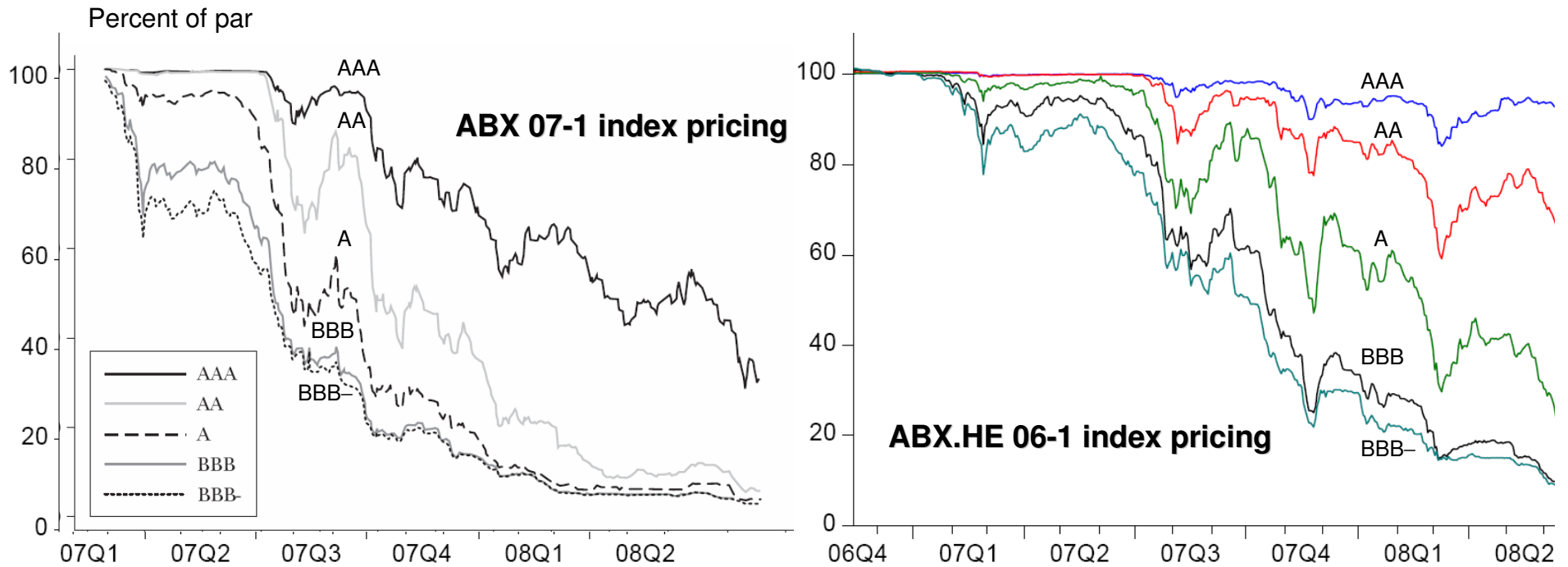


# Prototypical CDO tranching structure



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# Sub-prime mortgage-related risk pricing



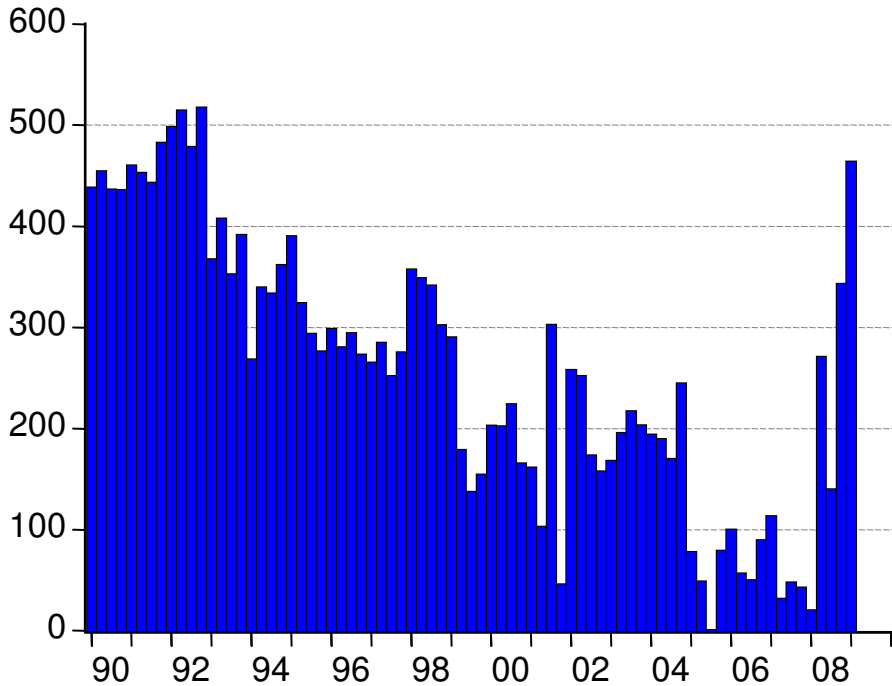
Based on baskets of 20 CDS-referencing asset-backed securities containing sub-prime mortgages and home equity loans of different ratings; after initiation, fee (spread) that buyer pays is  $(100 - \text{ABX price})$ , plus, the upfront fee that previous sellers pay rises if ABX falls

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.

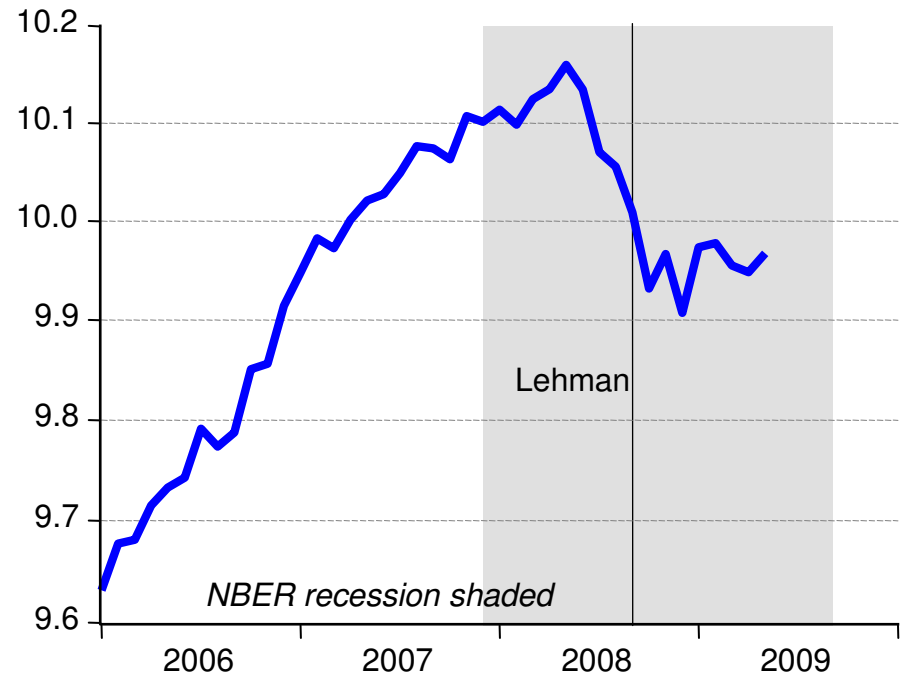
Slide copyright TZ Economics

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

# U.S. consumers change course



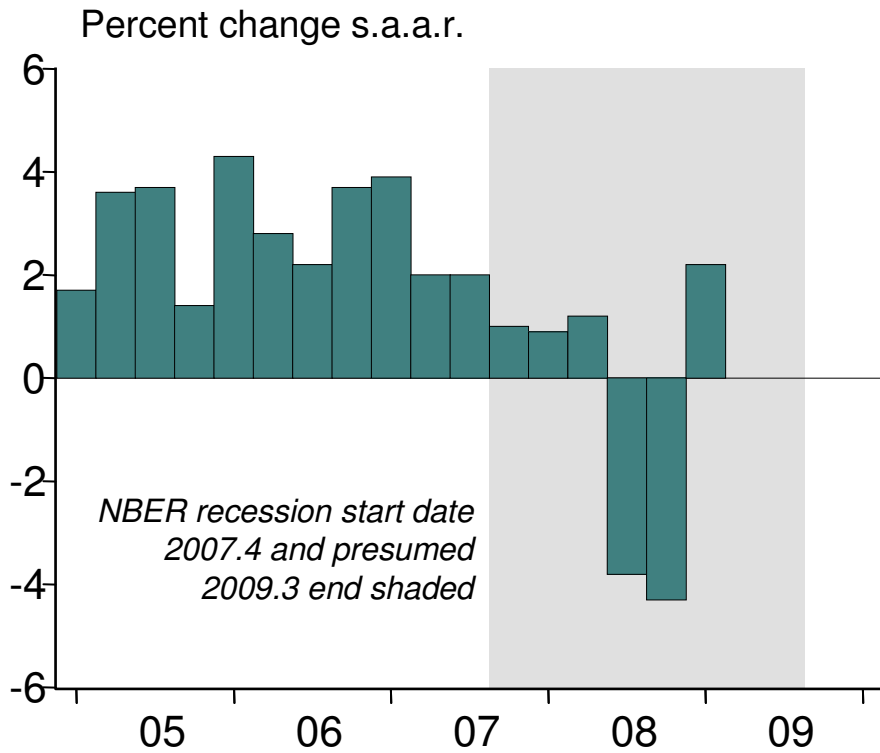
Real personal savings  
(quarterly s.a.a.r., billion 2008\$)



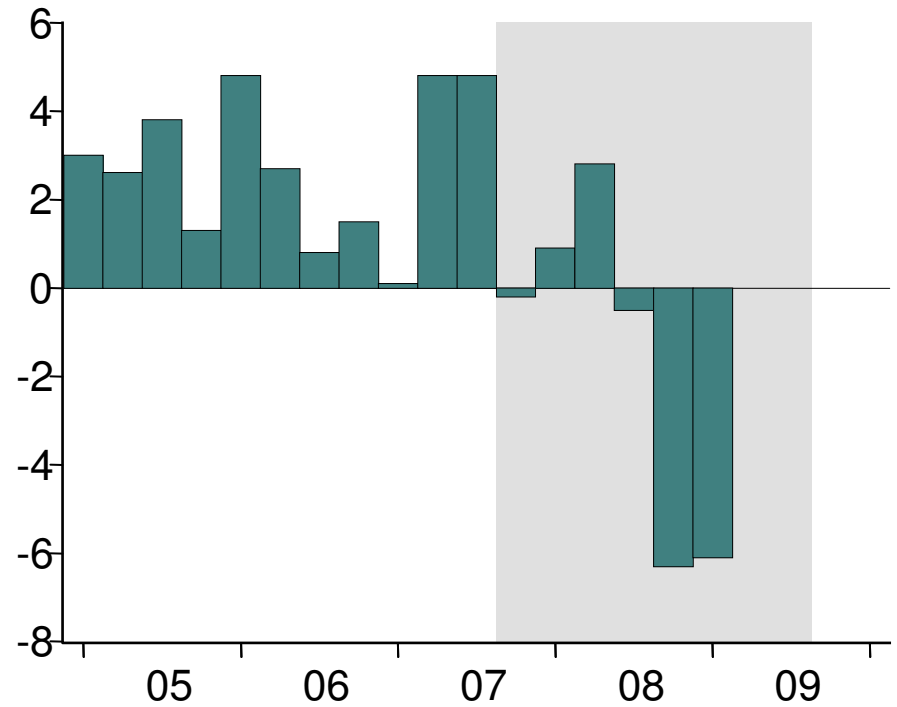
Personal consumption  
(monthly s.a.a.r., trillion 2008\$)



# Consumption *intensified* this recession

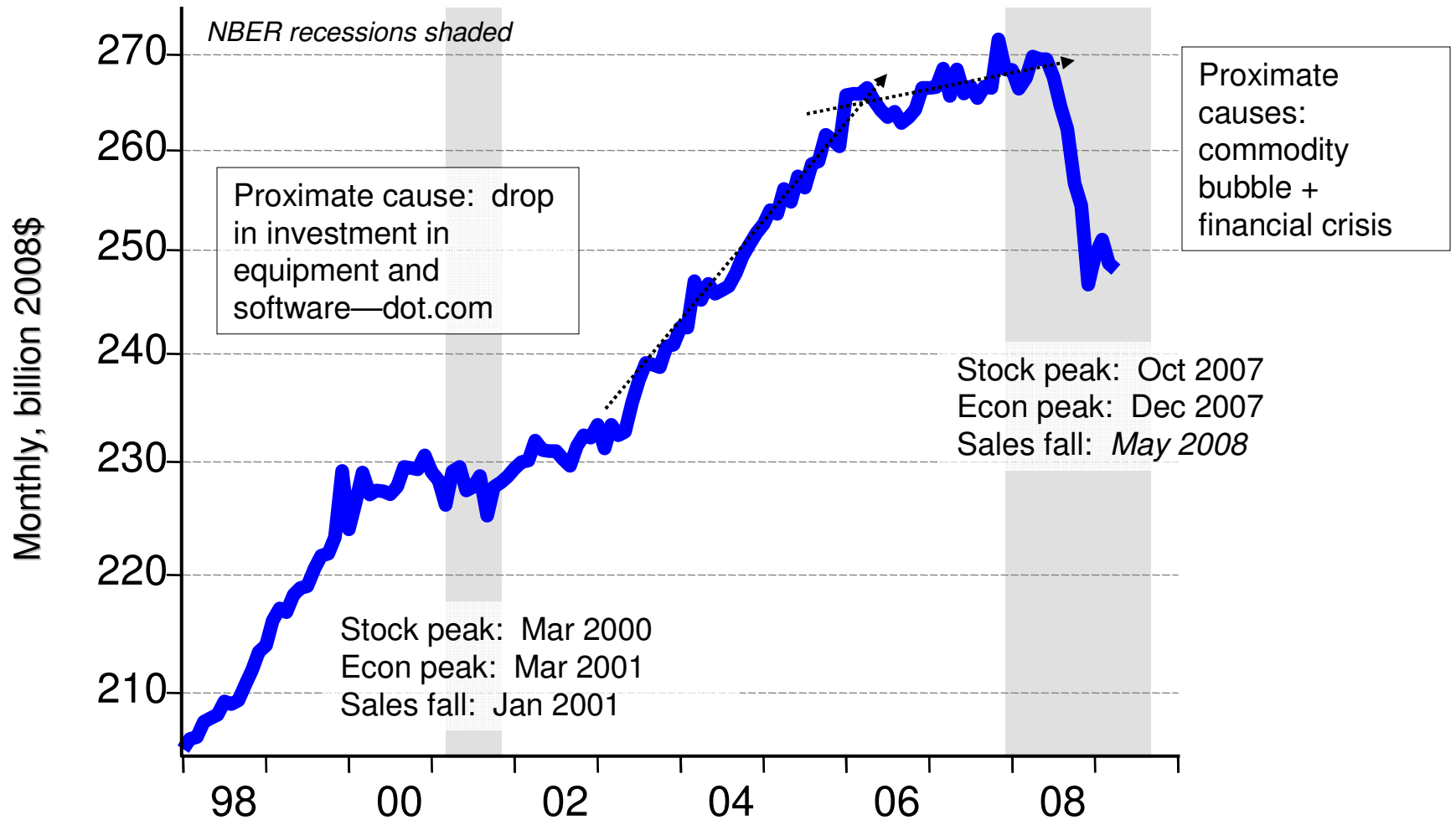


Real personal consumption growth



Real GDP growth

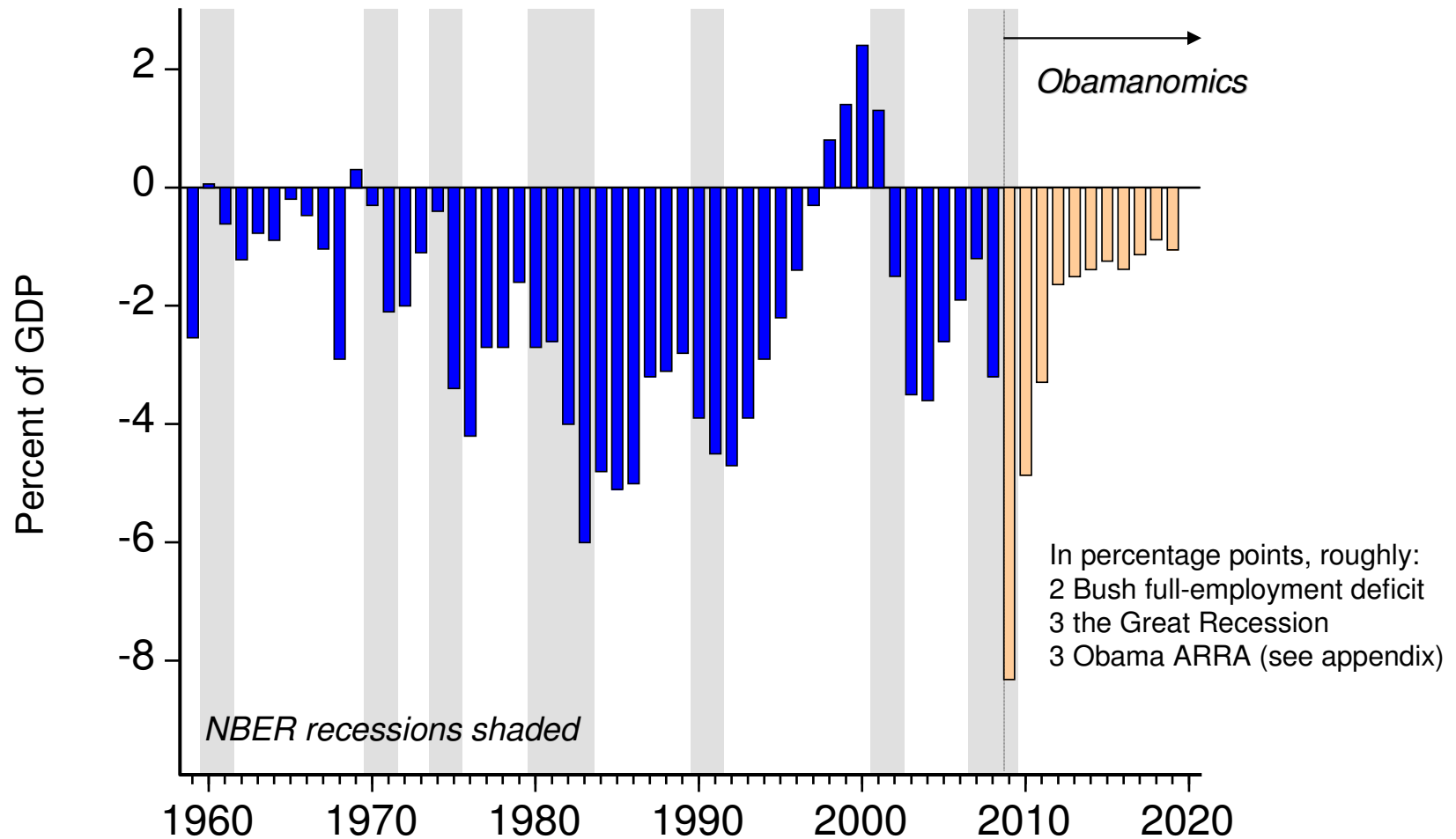
# Retail sales collapsed in second half 2008



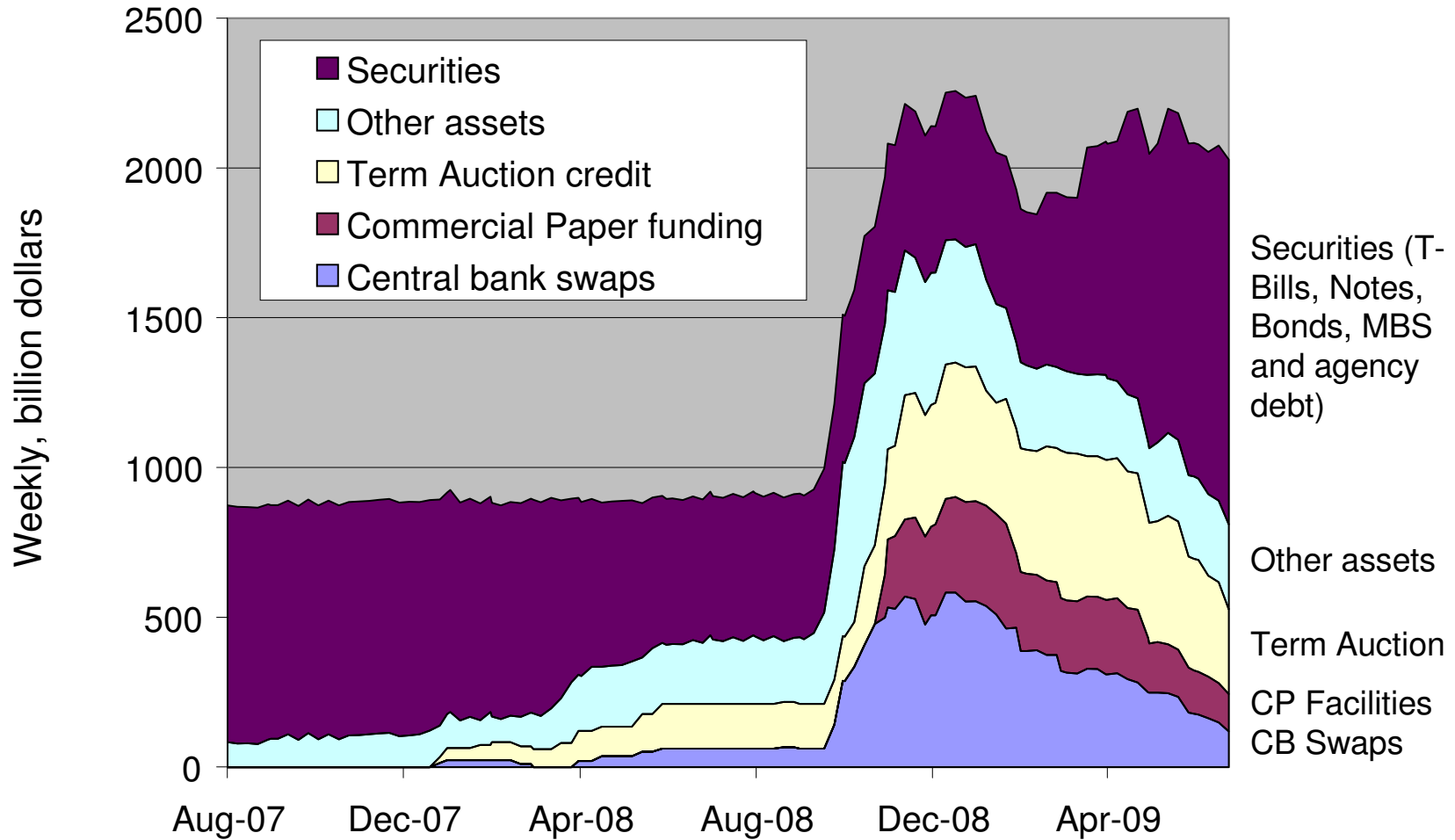
Slide copyright TZ Economics

Source: Bureau of Economic Analysis, U.S. Department of Commerce via FRED II; calculations by TZ Economics

# U.S. federal budget deficit as a percent of GDP

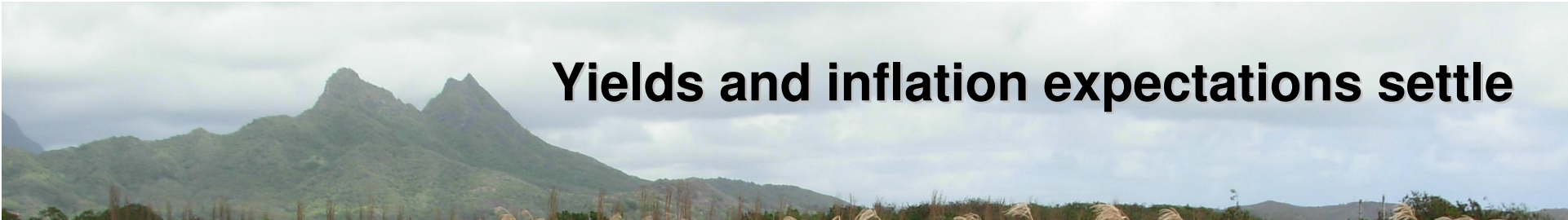


# Composition of Federal Reserve assets

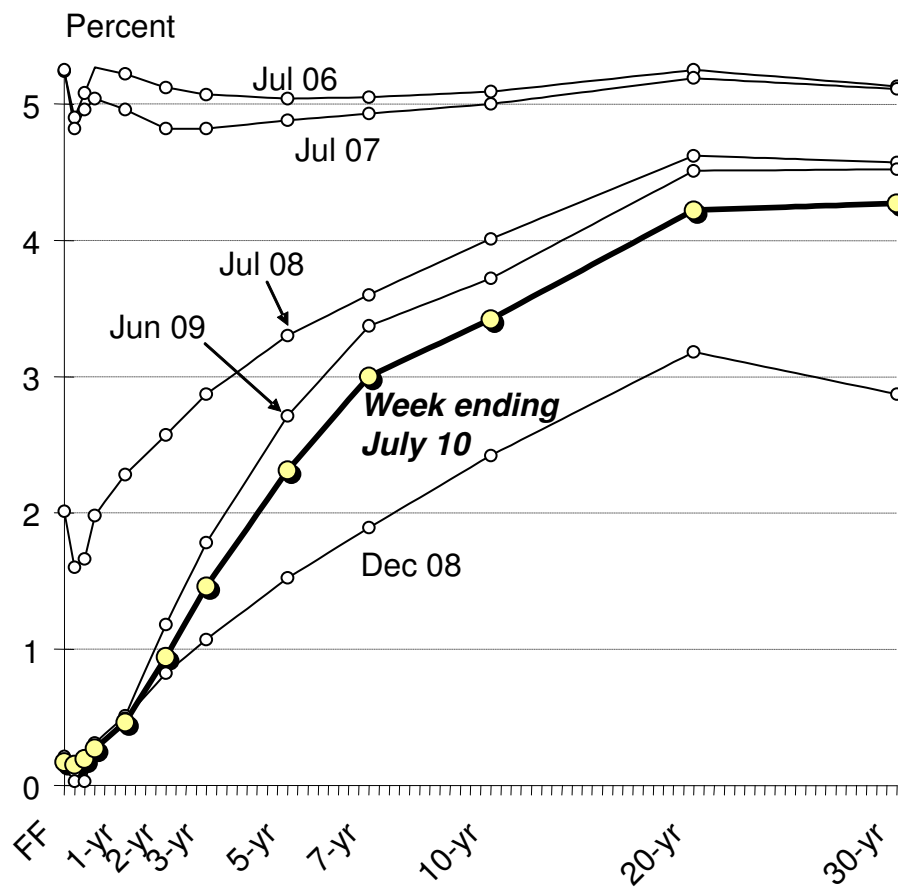


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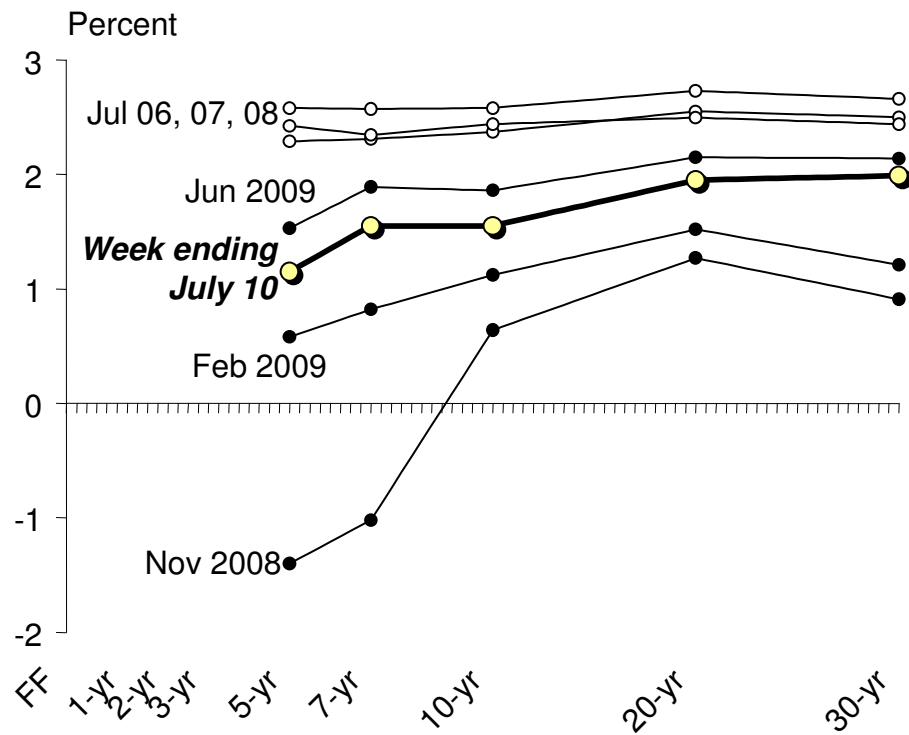
Sources: Federal Reserve Board; calculations by author



# Yields and inflation expectations settle

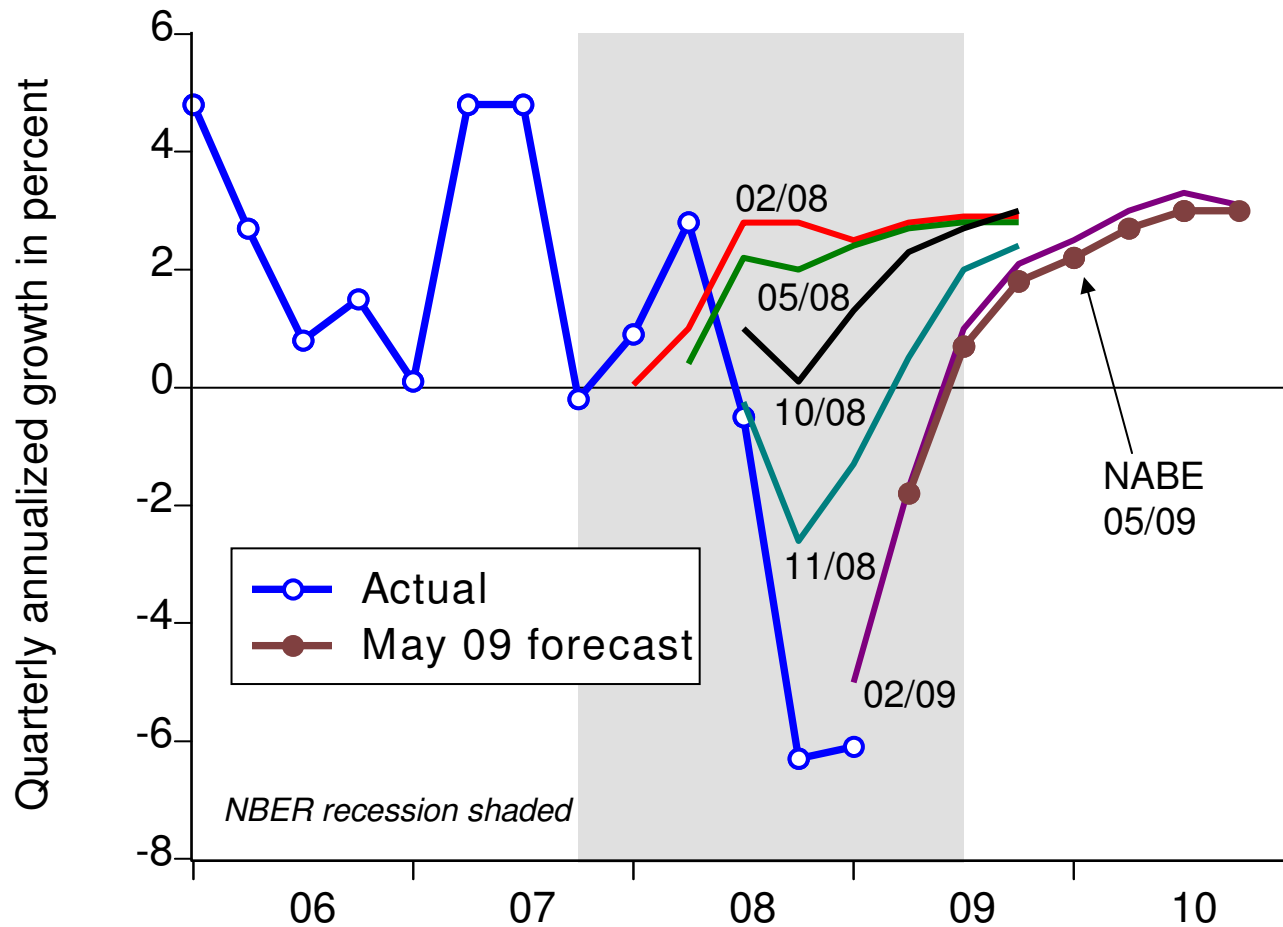


U.S. Treasury yield curve



Long-term inflation expectation implied by TIPS yields

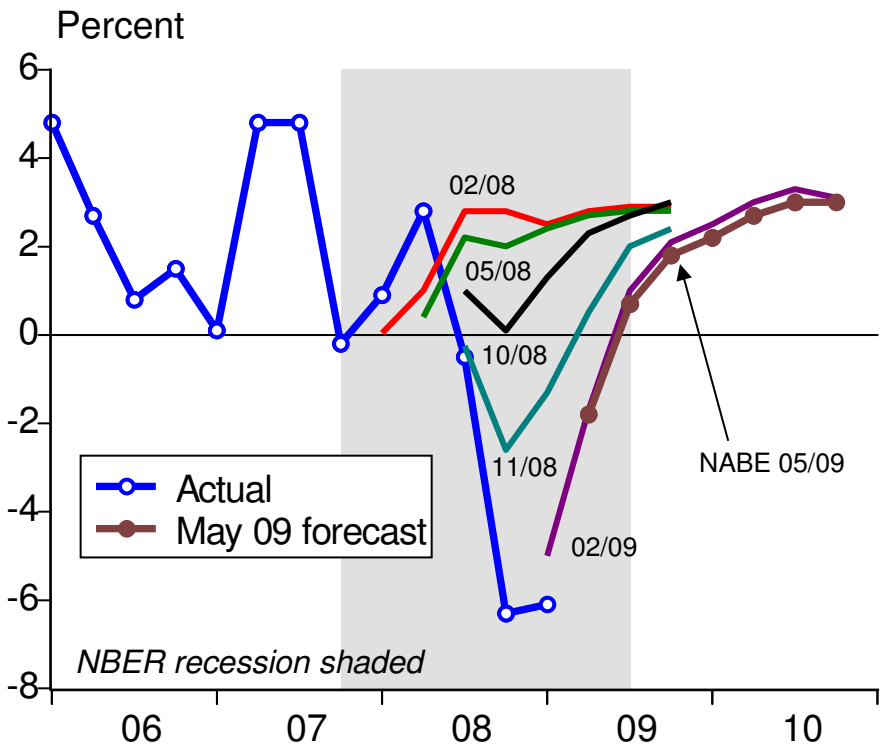
# U.S. real GDP forecasts (NABE)



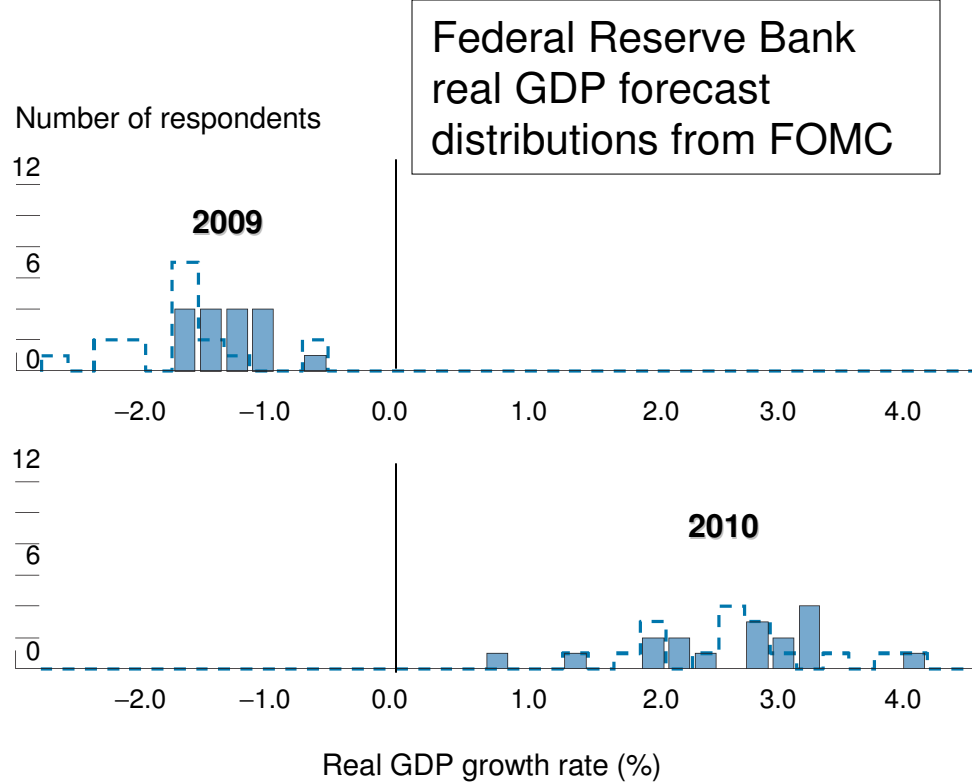
U.S. real economic growth forecasts were revised downward sharply in the post-Lehman environment but in first half 2009 have settled on a slow recovery forecast to begin late in 2009 and to accelerate during 2010



# U.S. real GDP forecasts



NABE U.S. real GDP growth forecast surveys





# FOMC forecast

Variable	Central tendency <sup>1</sup>			
	2009	2010	2011	Longer run
Change in real GDP. . . . .	-1.5 to -1.0	2.1 to 3.3	3.8 to 4.6	2.5 to 2.7
April projection. . . . .	-2.0 to -1.3	2.0 to 3.0	3.5 to 4.8	2.5 to 2.7
Unemployment rate. . . . .	9.8 to 10.1	9.5 to 9.8	8.4 to 8.8	4.8 to 5.0
April projection. . . . .	9.2 to 9.6	9.0 to 9.5	7.7 to 8.5	4.8 to 5.0
PCE inflation. . . . .	1.0 to 1.4	1.2 to 1.8	1.1 to 2.0	1.7 to 2.0
April projection. . . . .	0.6 to 0.9	1.0 to 1.6	1.0 to 1.9	1.7 to 2.0
Core PCE inflation <sup>3</sup> . . . . .	1.3 to 1.6	1.0 to 1.5	0.9 to 1.7	
April projection. . . . .	1.0 to 1.5	0.7 to 1.3	0.8 to 1.6	

1. The central tendency excludes the three highest and three lowest projections for each variable in each year.  
 2. The range for a variable in a given year consists of all participants' projections, from lowest to highest, for that variable in that year.  
 3. Longer-run projections for core PCE inflation are not collected.

Target Fed Funds as f[inflation gap, output (growth) gap]:

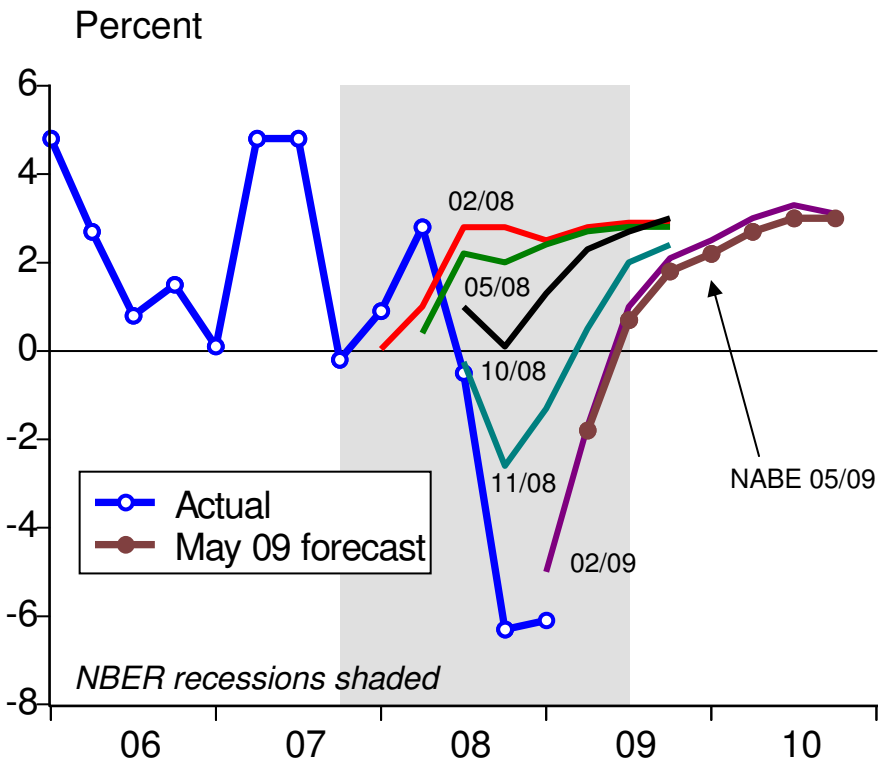
$$r^* = [4.5 + (0.5)(p - p^*) + (0.5)(y - y^*)]$$

r = Fed Funds rate

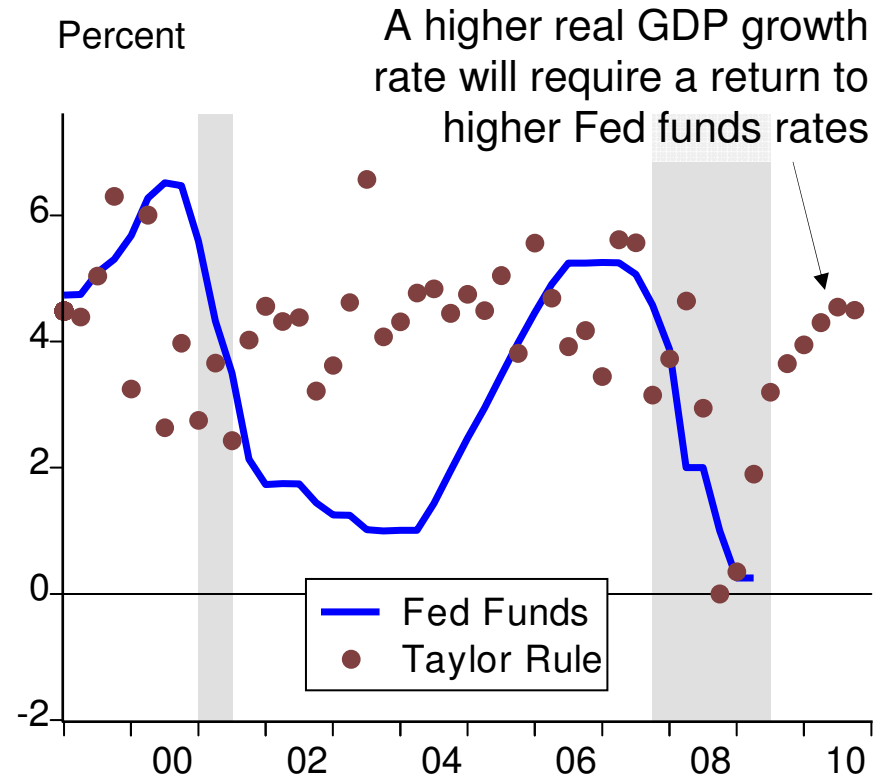
p = increase in the core CPI [p\* =2 (target)]

y = real GDP growth rate [y\* = potential GDP growth]

# Taylor Rule update



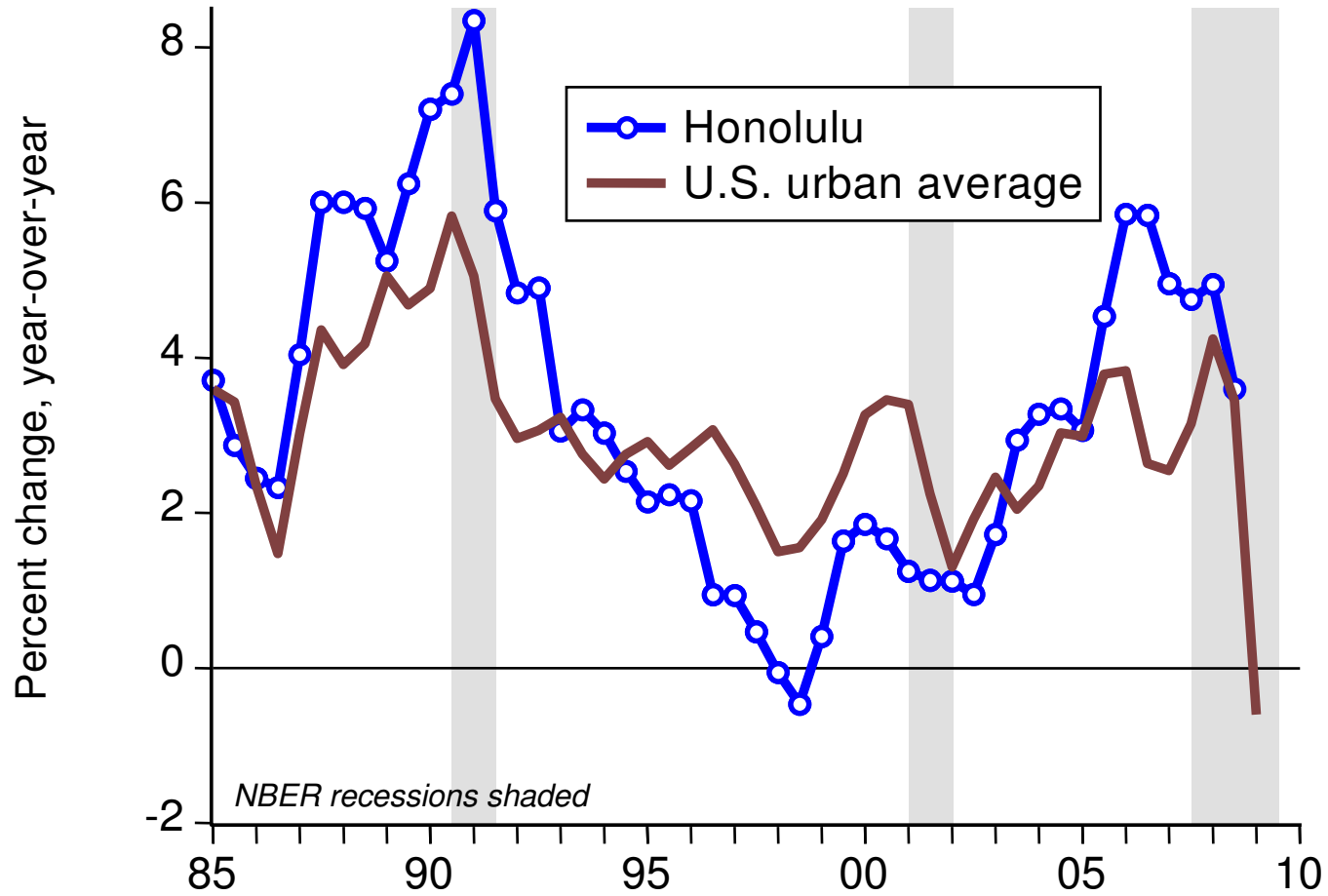
U.S. real GDP growth forecasts (NABE)



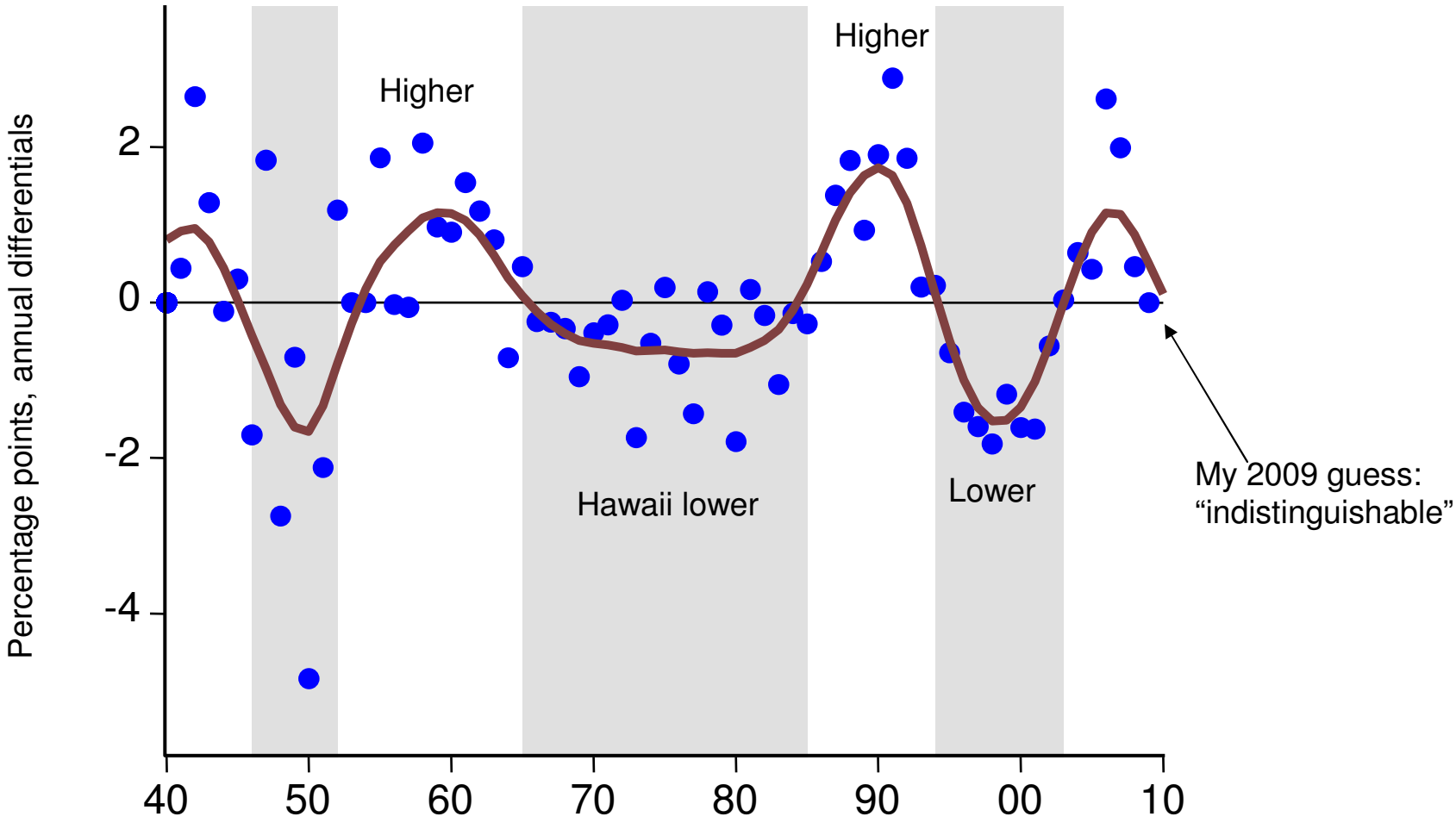
Fed funds target under Taylor Rule



# Consumer price inflation—semiannual data



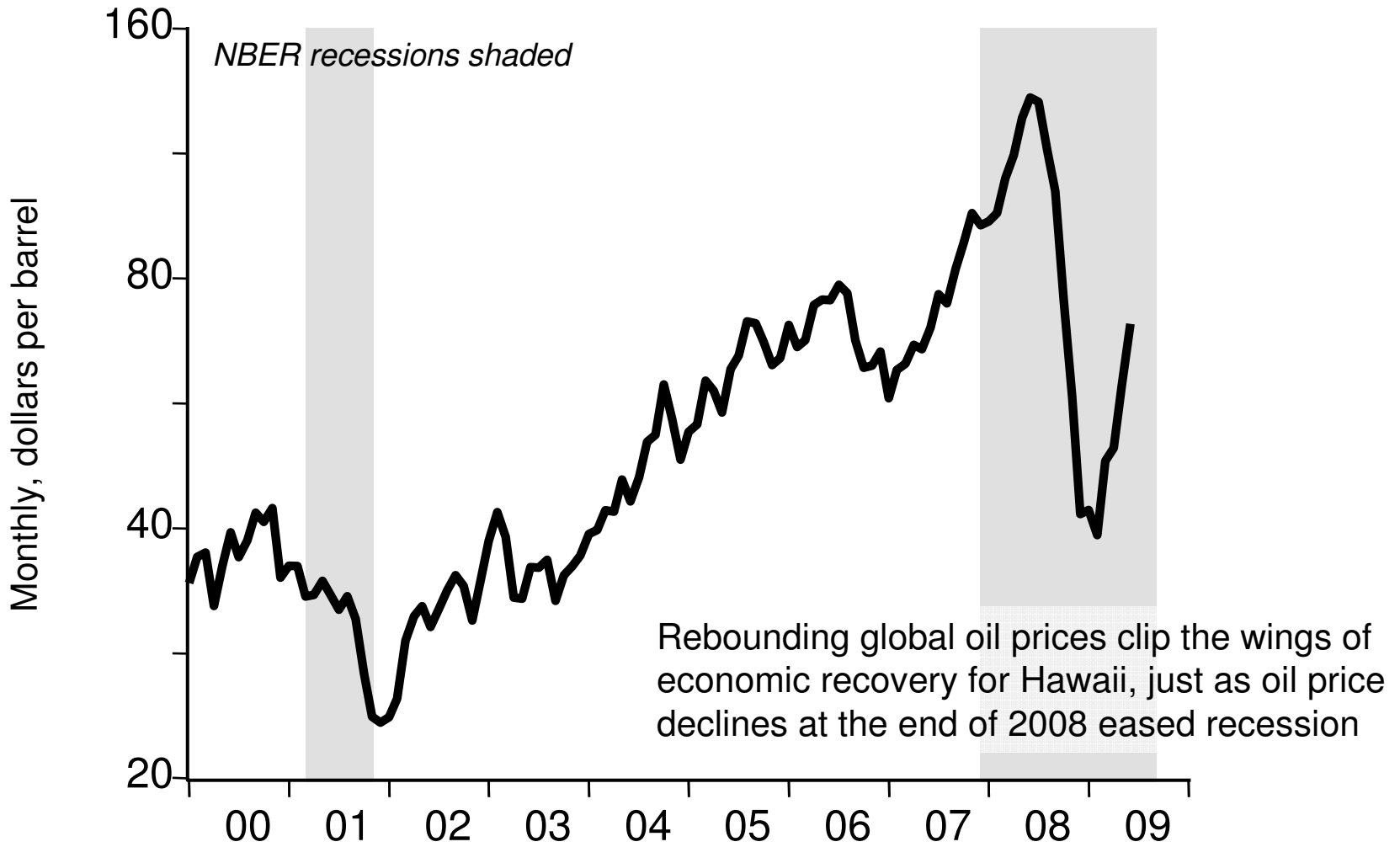
# Honolulu minus U.S. urban inflation differential



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Source: Bureau of Labor Statistics, U.S. Department of Labor; TZE

# U.S. domestic crude petroleum prices

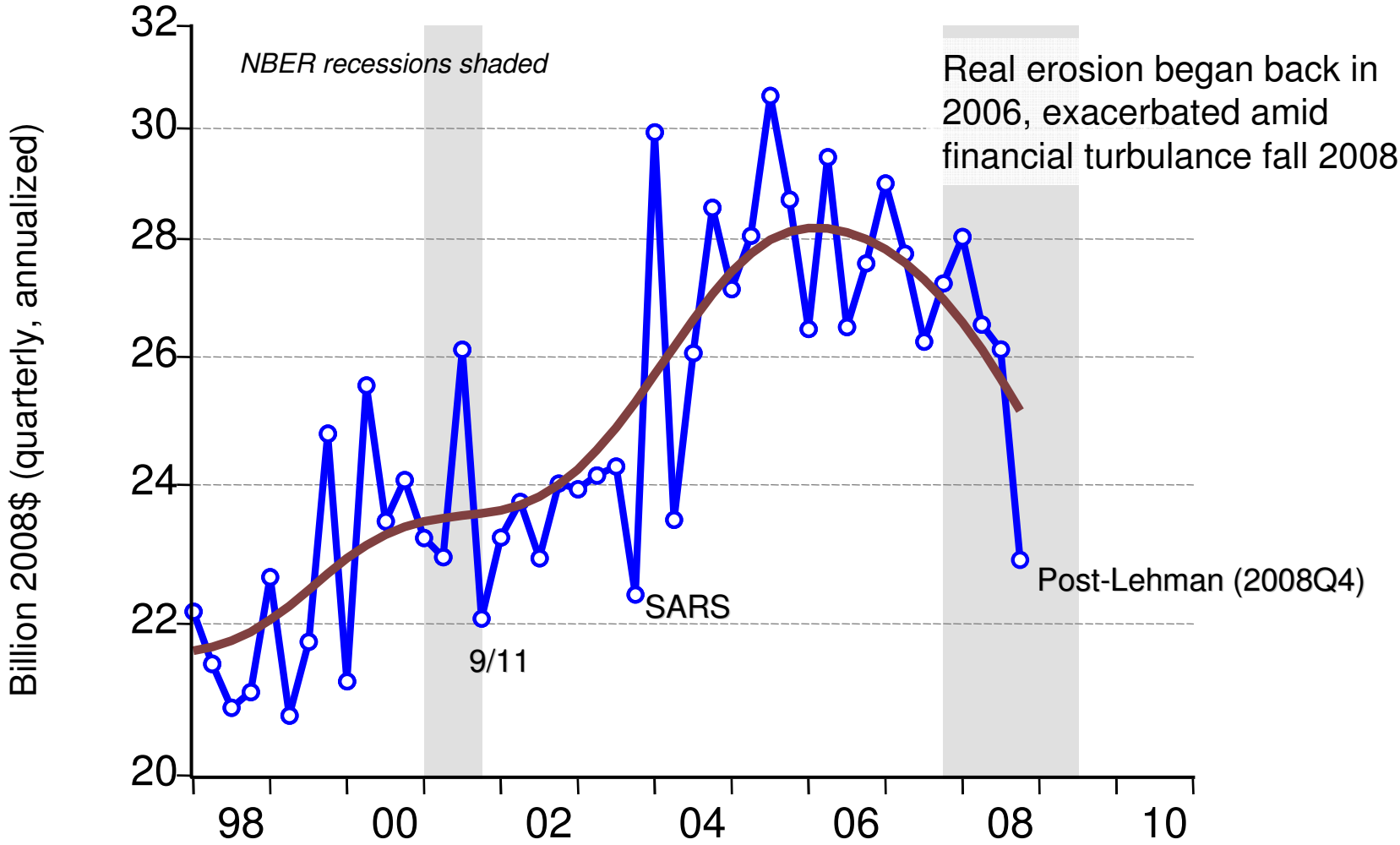


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# Maui and the statewide economy

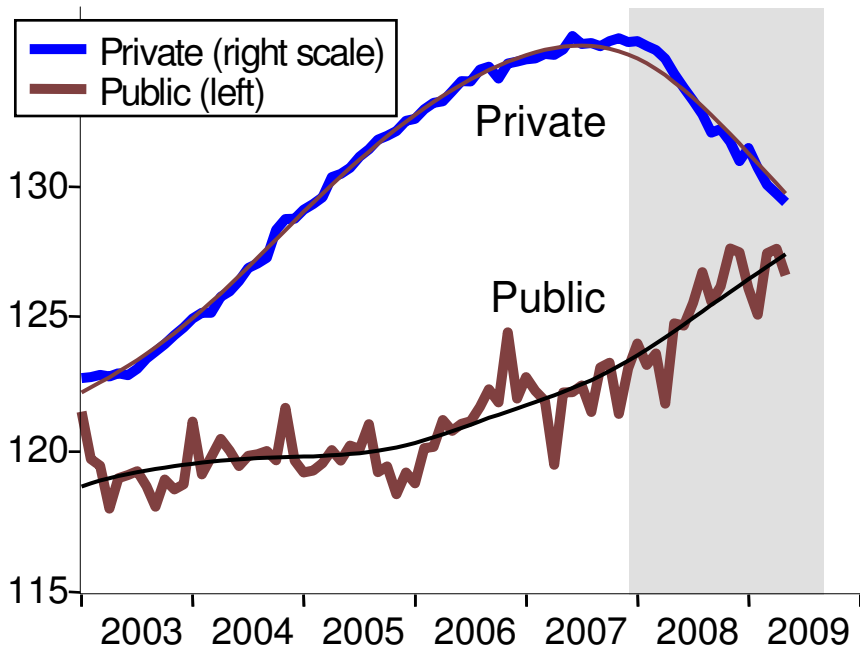
# Hawaii real retail: collapse Post-Lehman



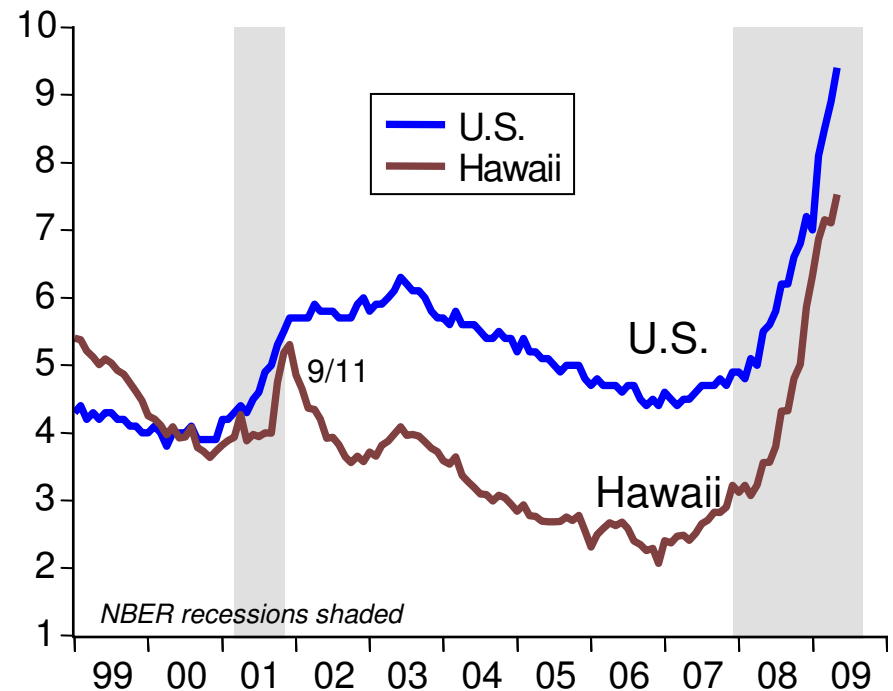
Source: Hawaii Department of Taxation; deflation with Honolulu CPI-U and Hodrick-Prescott filter by TZE



# Hawaii statewide employment trends



Payroll employment (jobs, thous. s.a.)

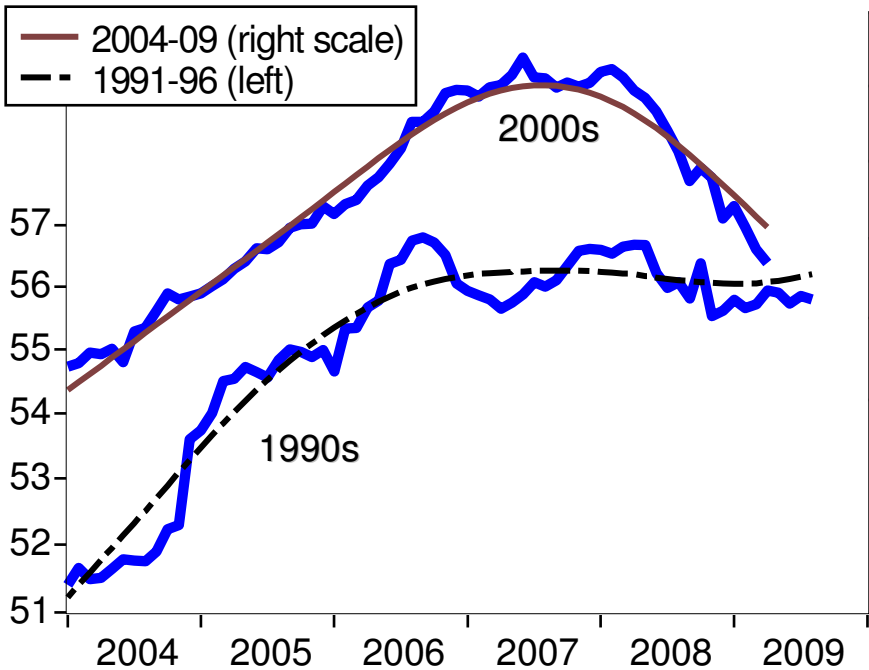


Unemployment rate (percent, s.a.)



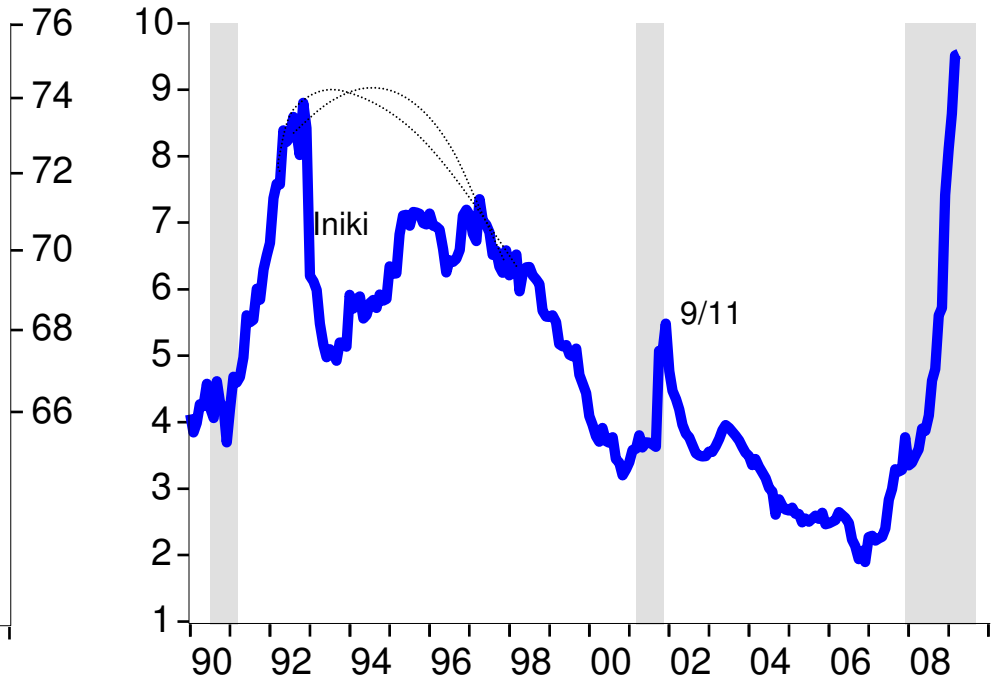
# Maui employment trends

Thousands, s.a., log scale



Job loss: worse than the 1990s

Percent, s.a.

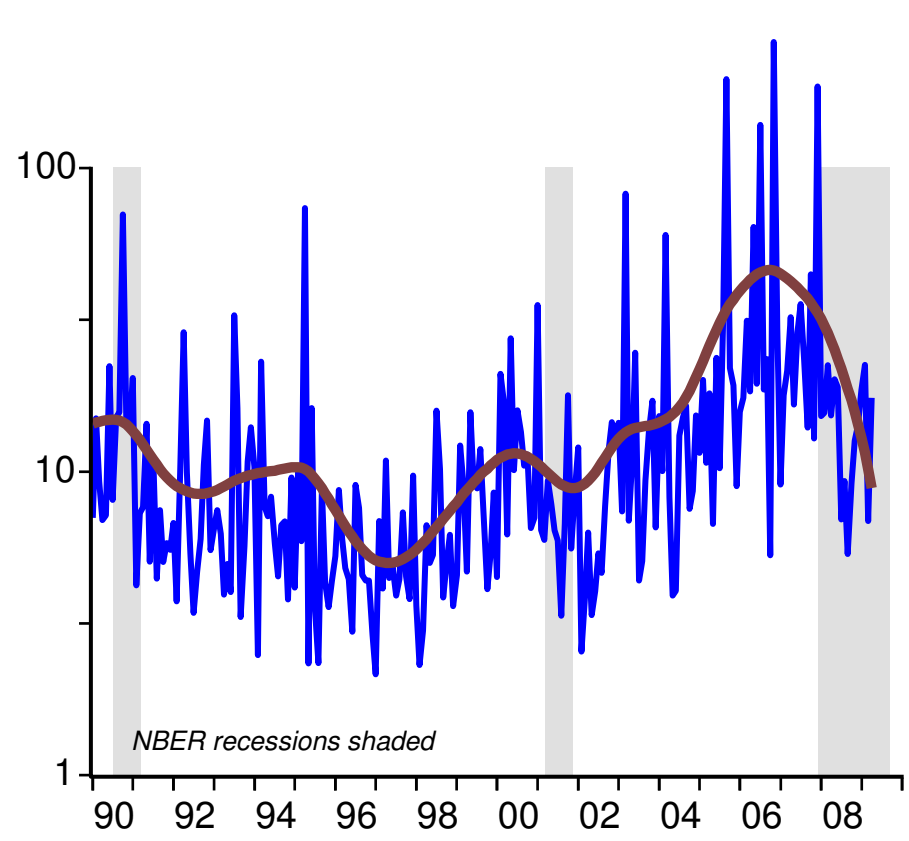
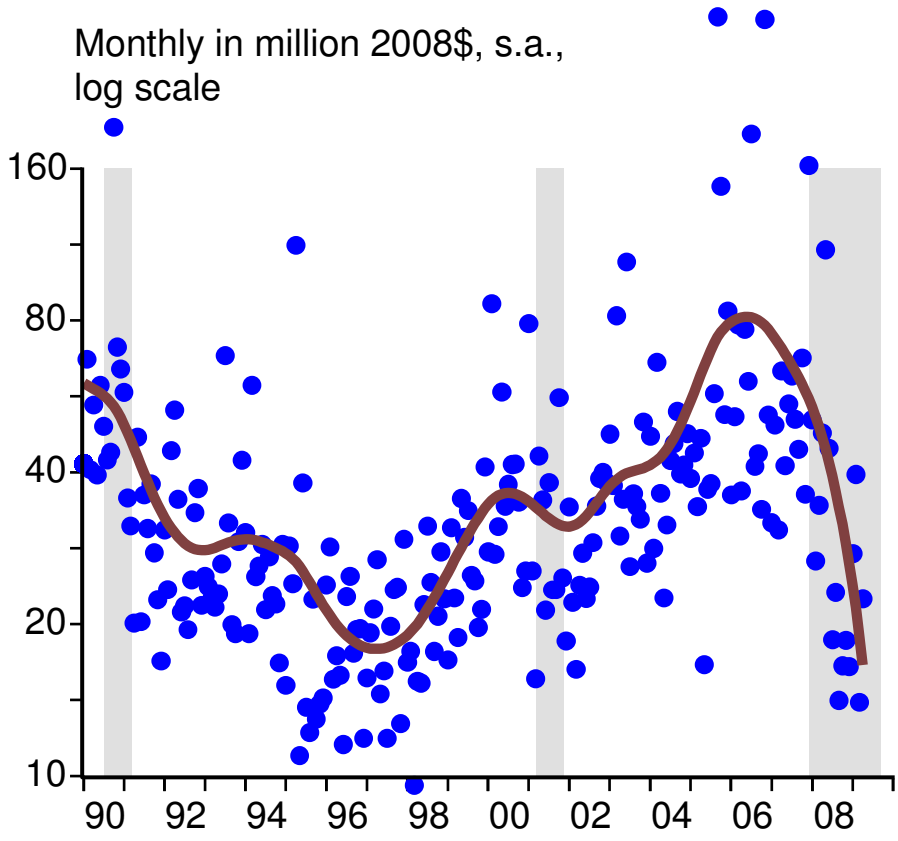


Unemployment rate: same as U.S.



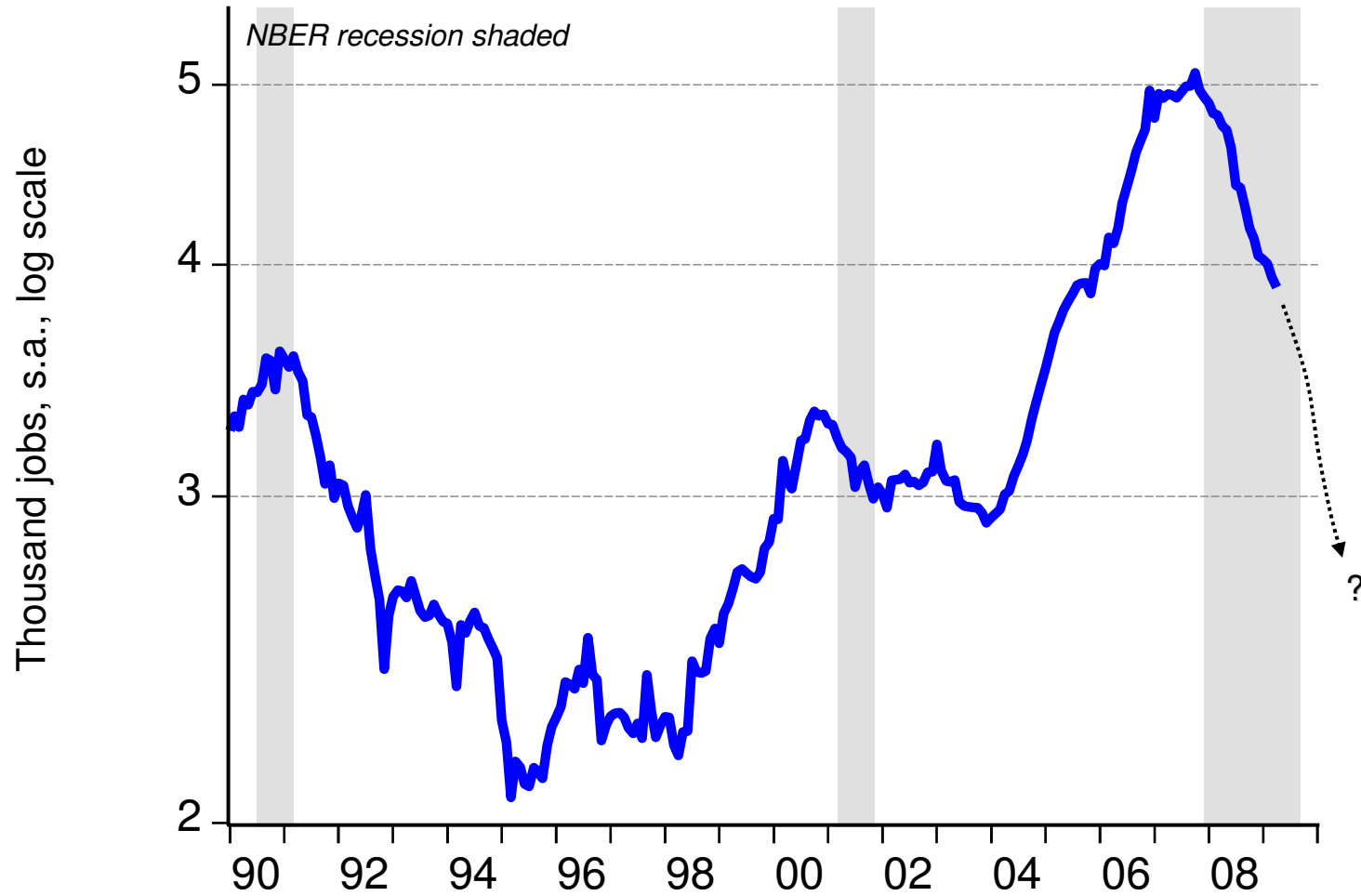
# Monthly Maui real construction commitments

Monthly in million 2008\$, s.a.,  
log scale





# Monthly Maui construction employment



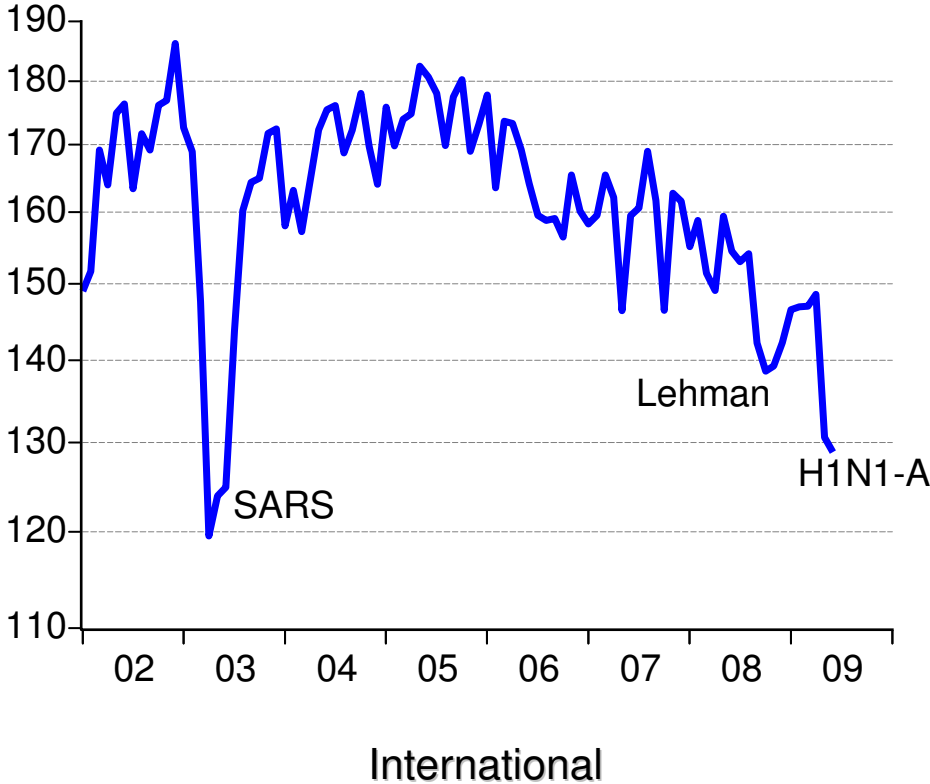
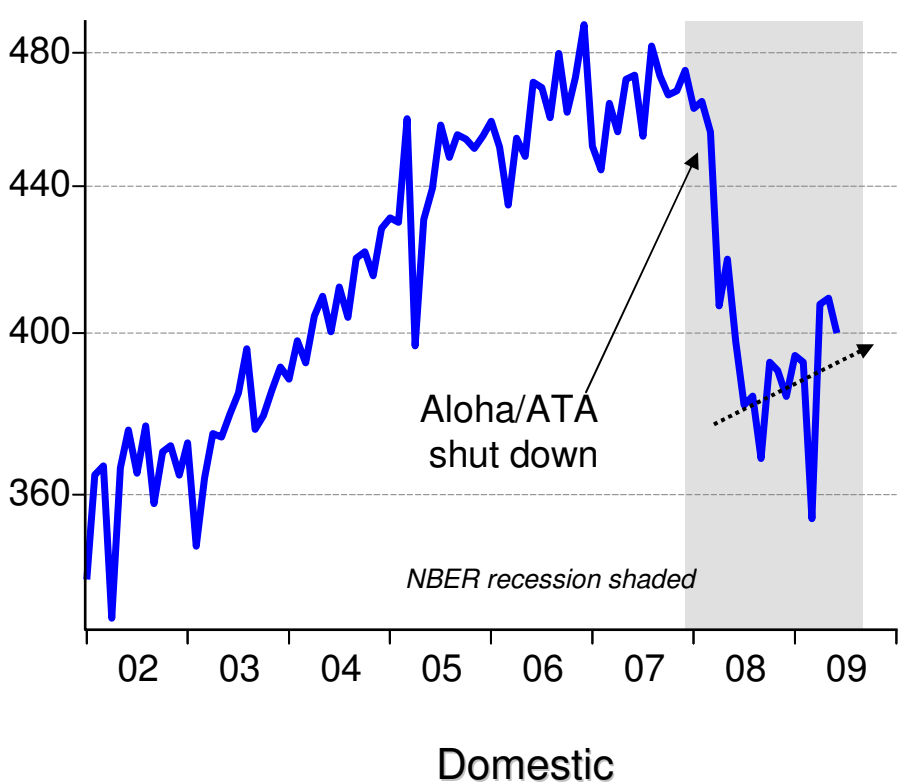
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Sources: Hawaii DBEDT; deflation, seasonal adjustment and trend calculations by TZE



# Statewide visitor arrivals

Monthly s.a., thousands, log scales

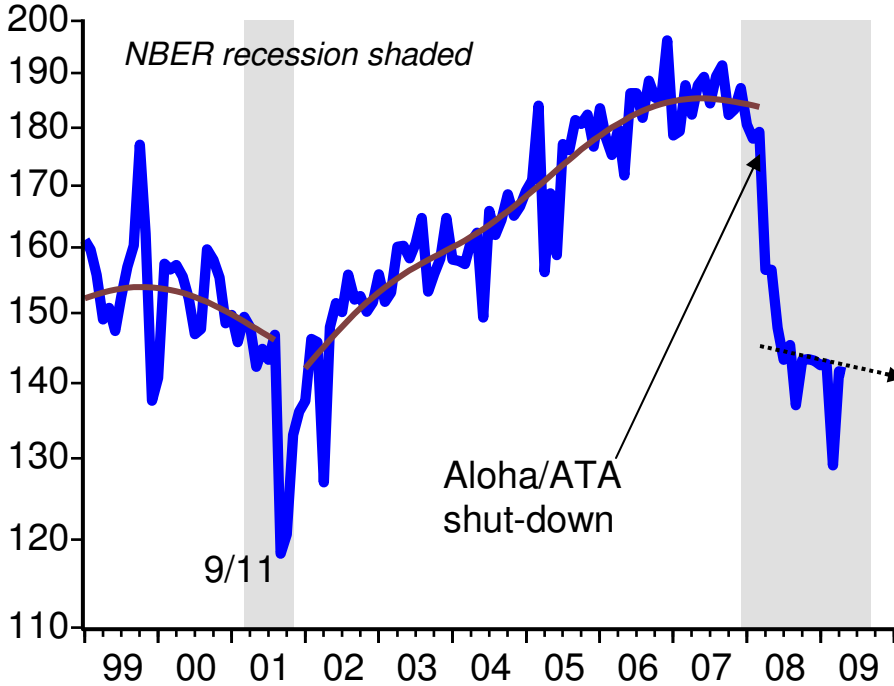


\*Includes June estimates based on daily passenger counts through June 25

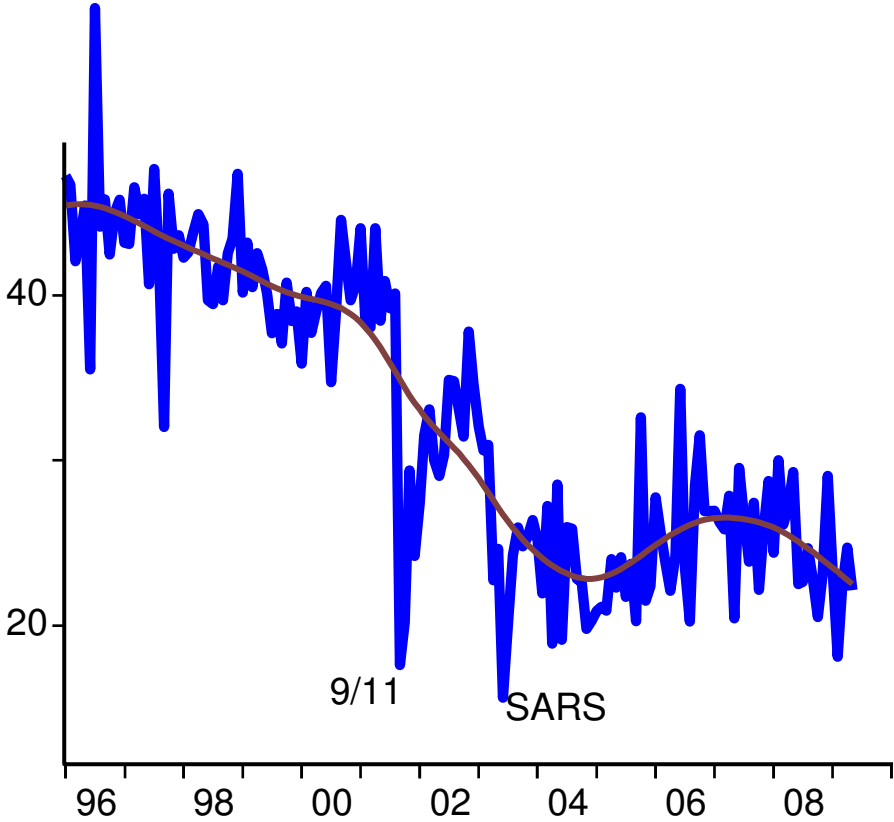


# Maui visitor arrivals

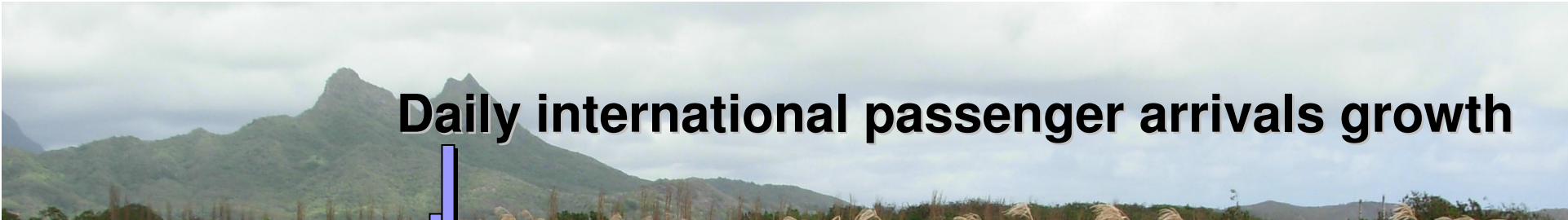
Thousands, s.a., log scale



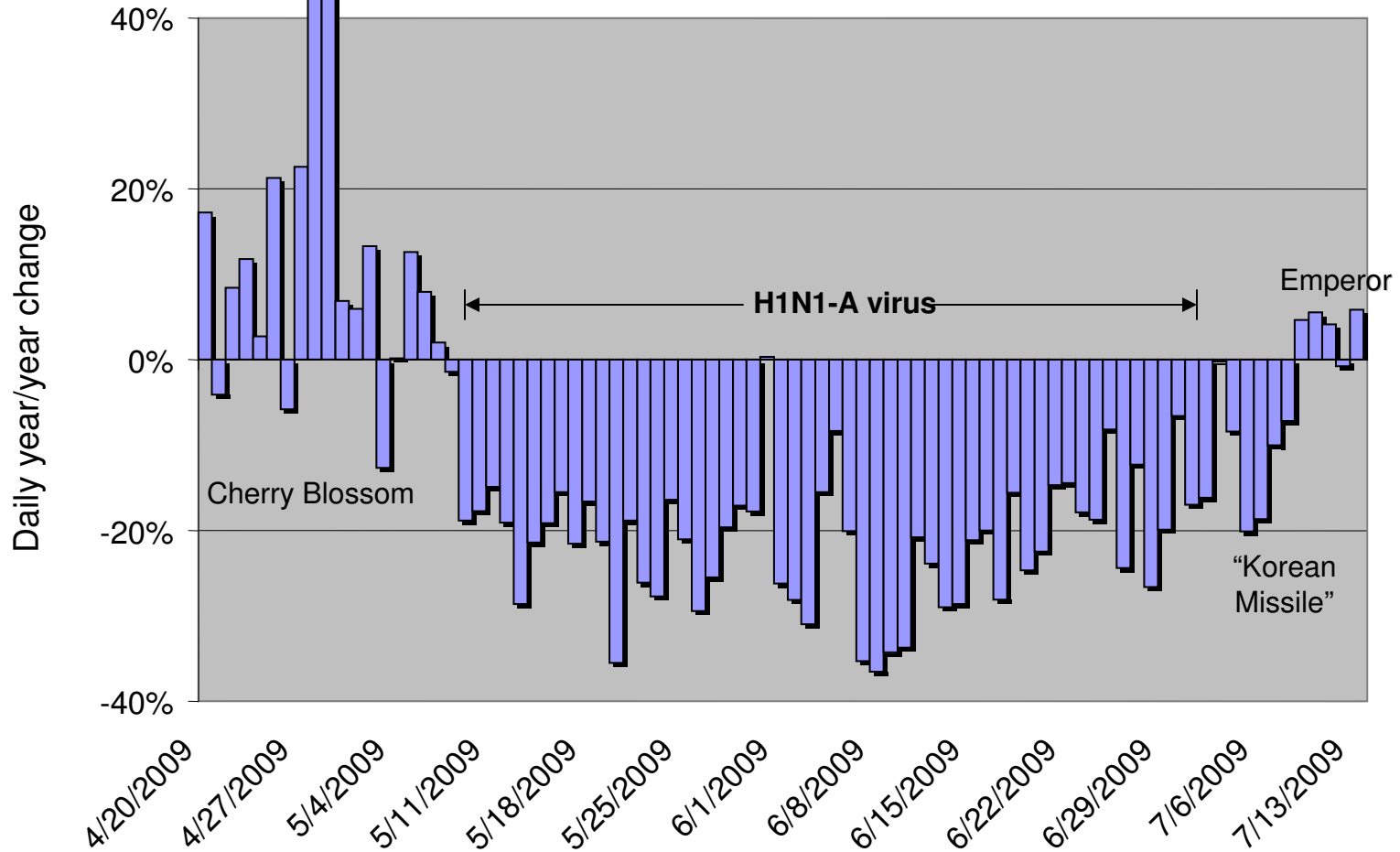
Domestic



International



# Daily international passenger arrivals growth

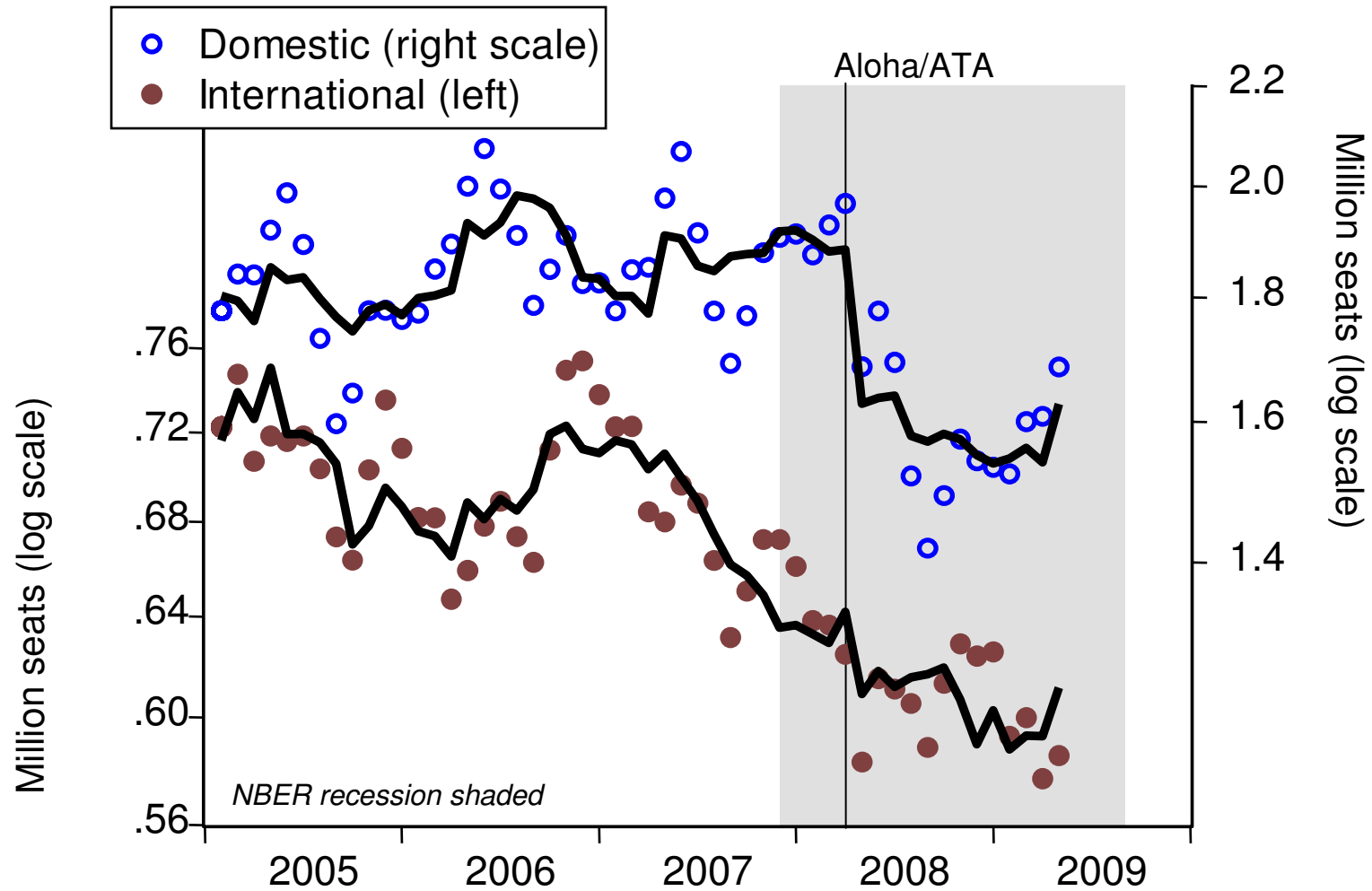


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Sources: Hawaii DBEDT; calculations by TZE



# Monthly scheduled lift trends



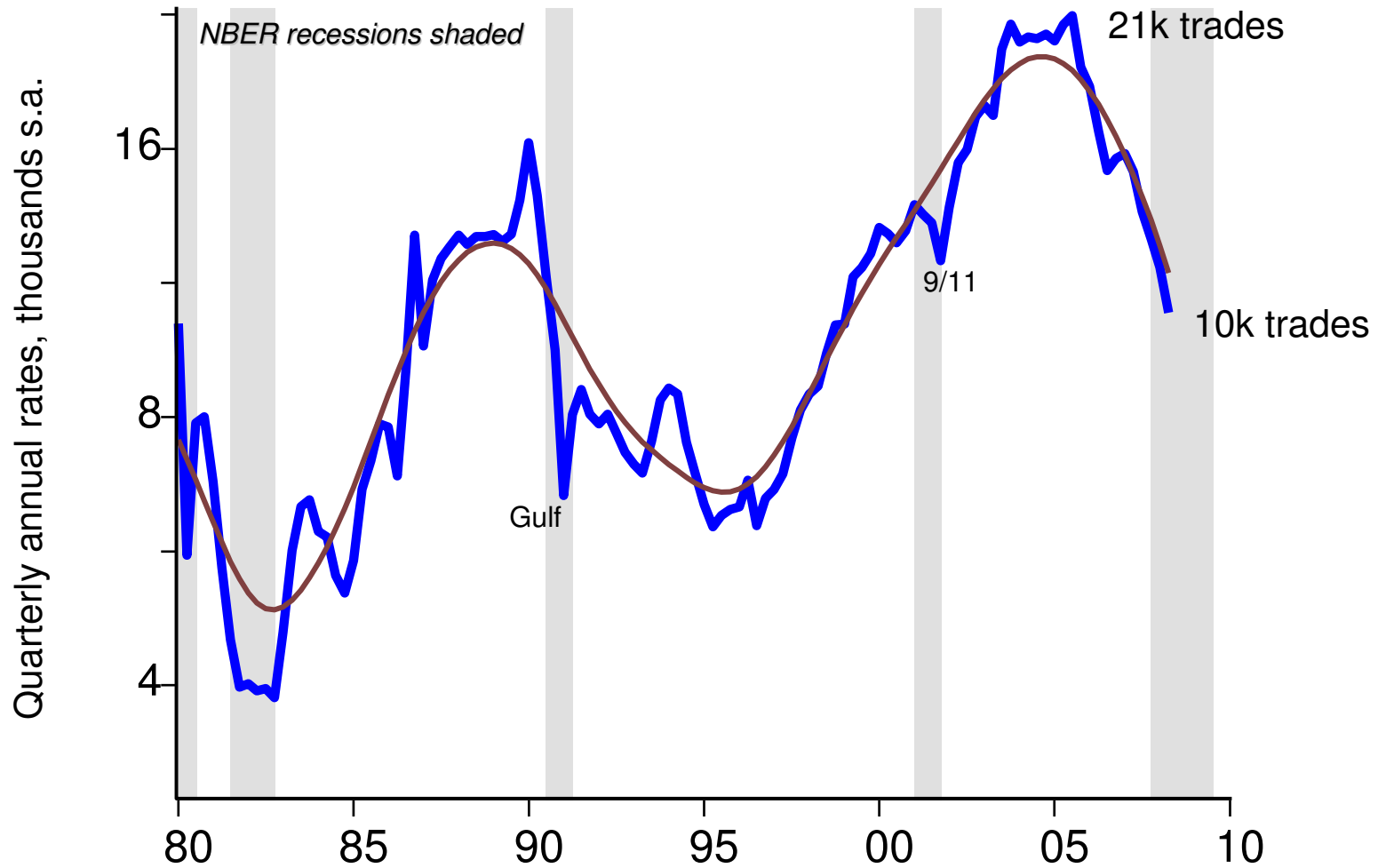
Slide copyright TZ Economics

Source: Hawaii DBEDT, UHERO; seasonal adjustment using ratio-to-moving average on limited data by TZE



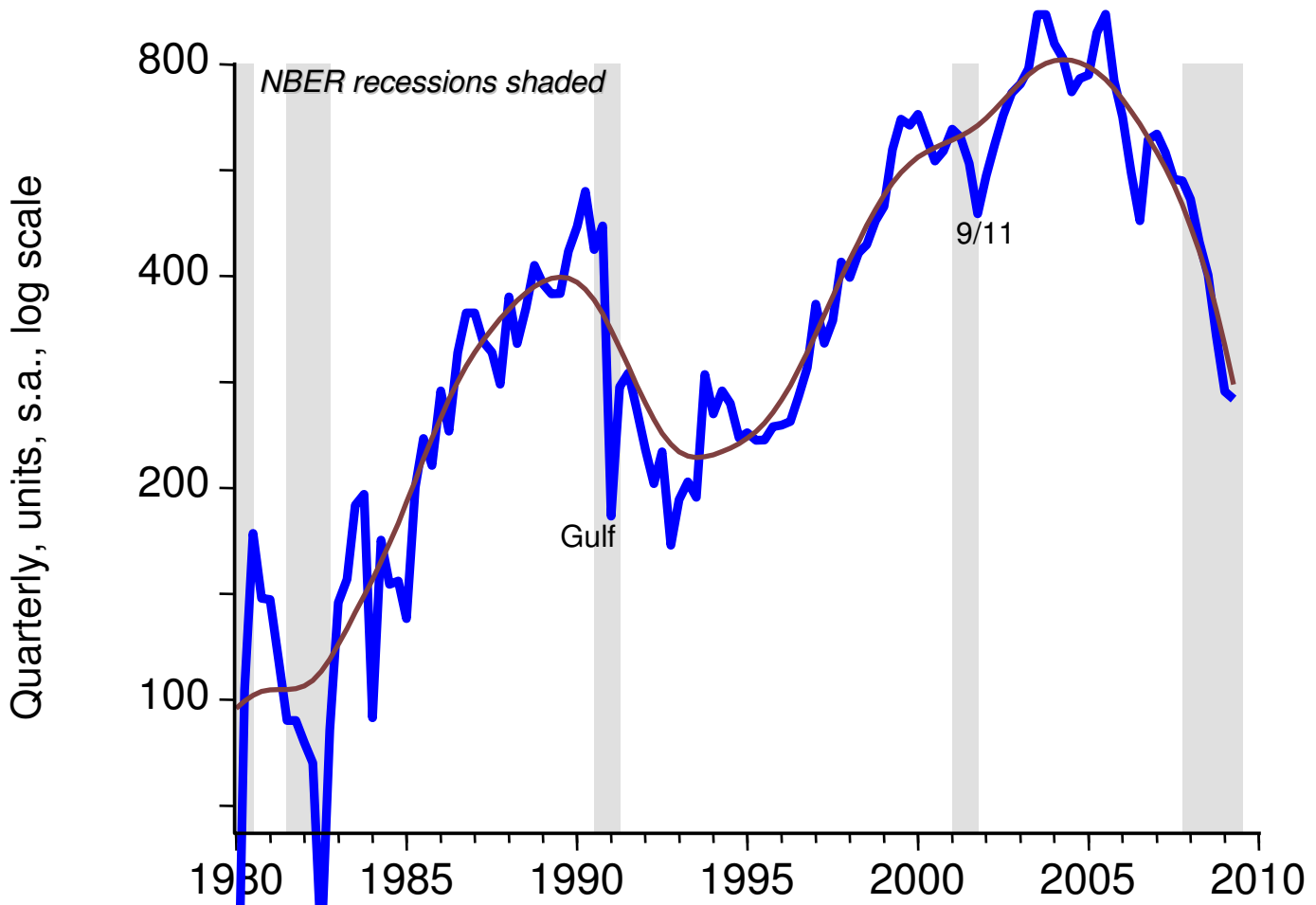
# The housing cycle

# Statewide total existing home sales



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# Sales of existing Maui homes



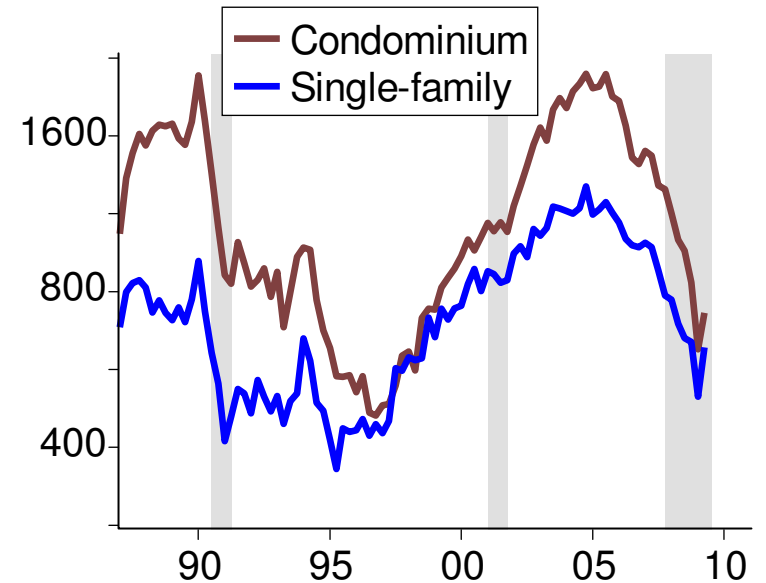
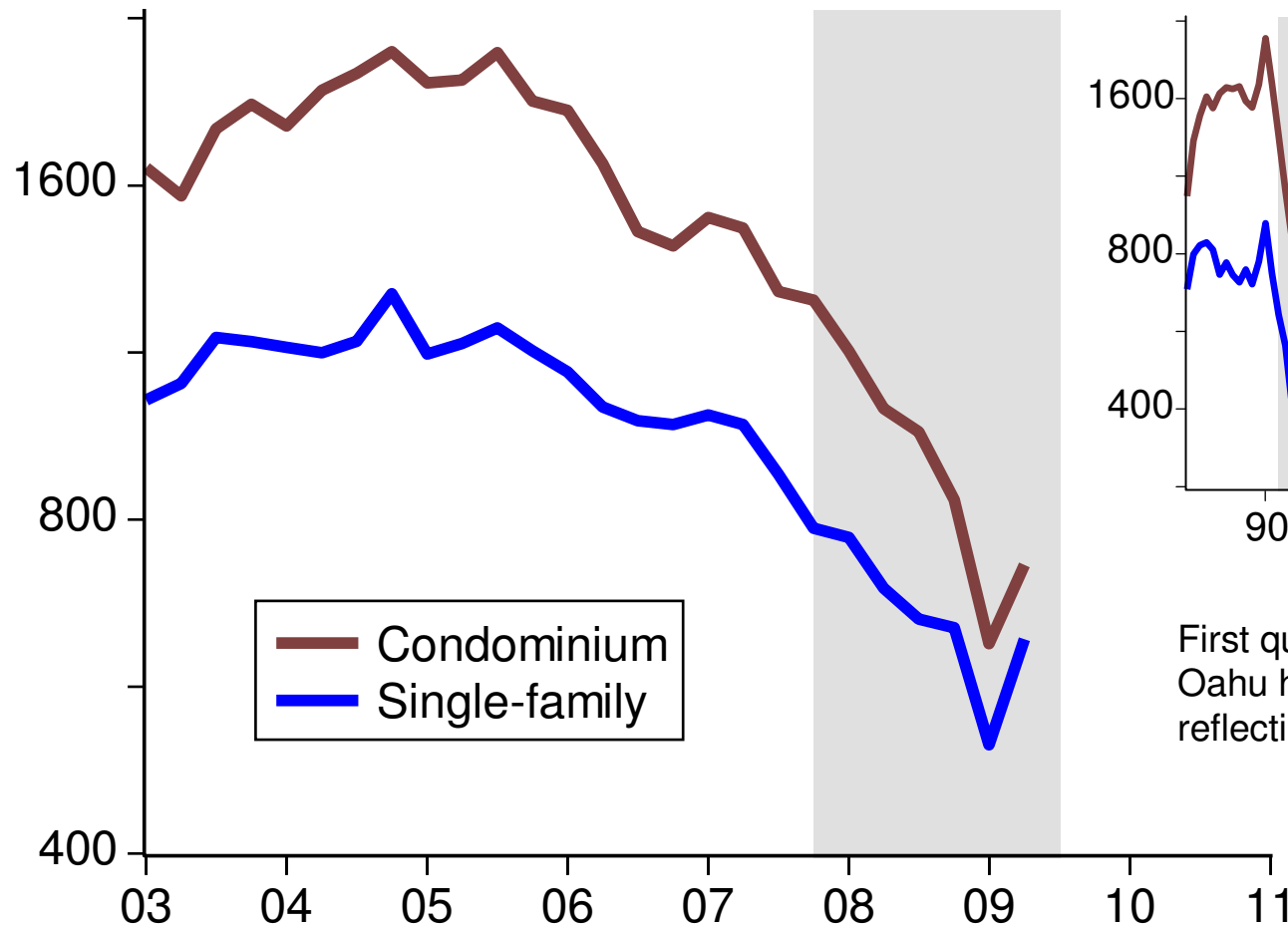
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Sources: UHERO, Realtors Association of Maui; seasonal adjustment, H-P filter trend calculations by TZE



# Oahu home sales bottomed?

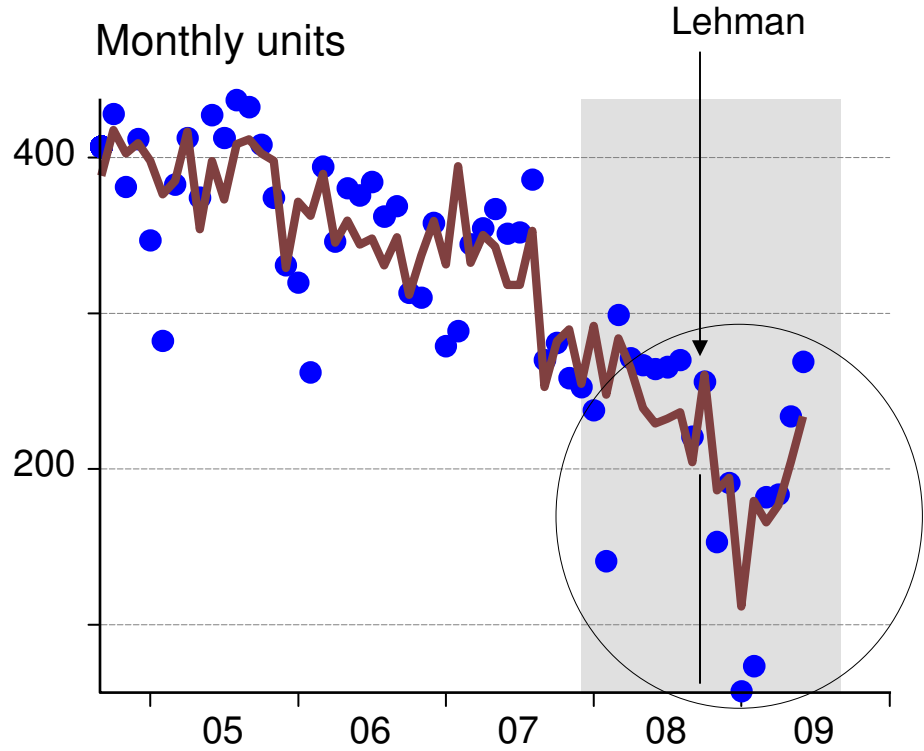
Monthly units, seasonally-adjusted



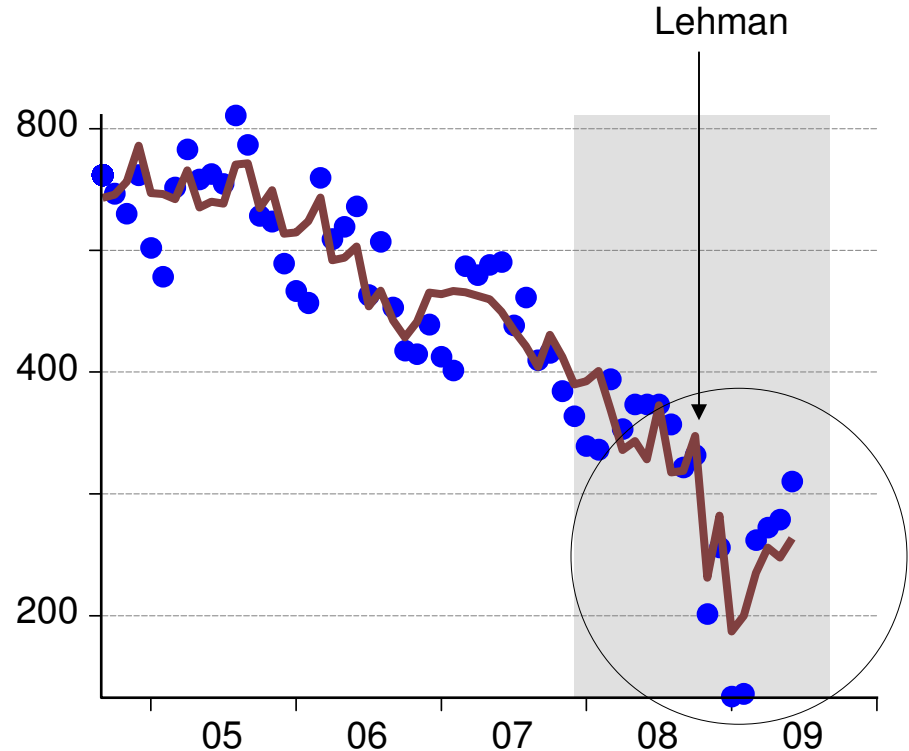
First quarter seasonally-adjusted Oahu home resales were low, reflecting the post-Lehman meltdown



# Post-Lehman: drop and recovery



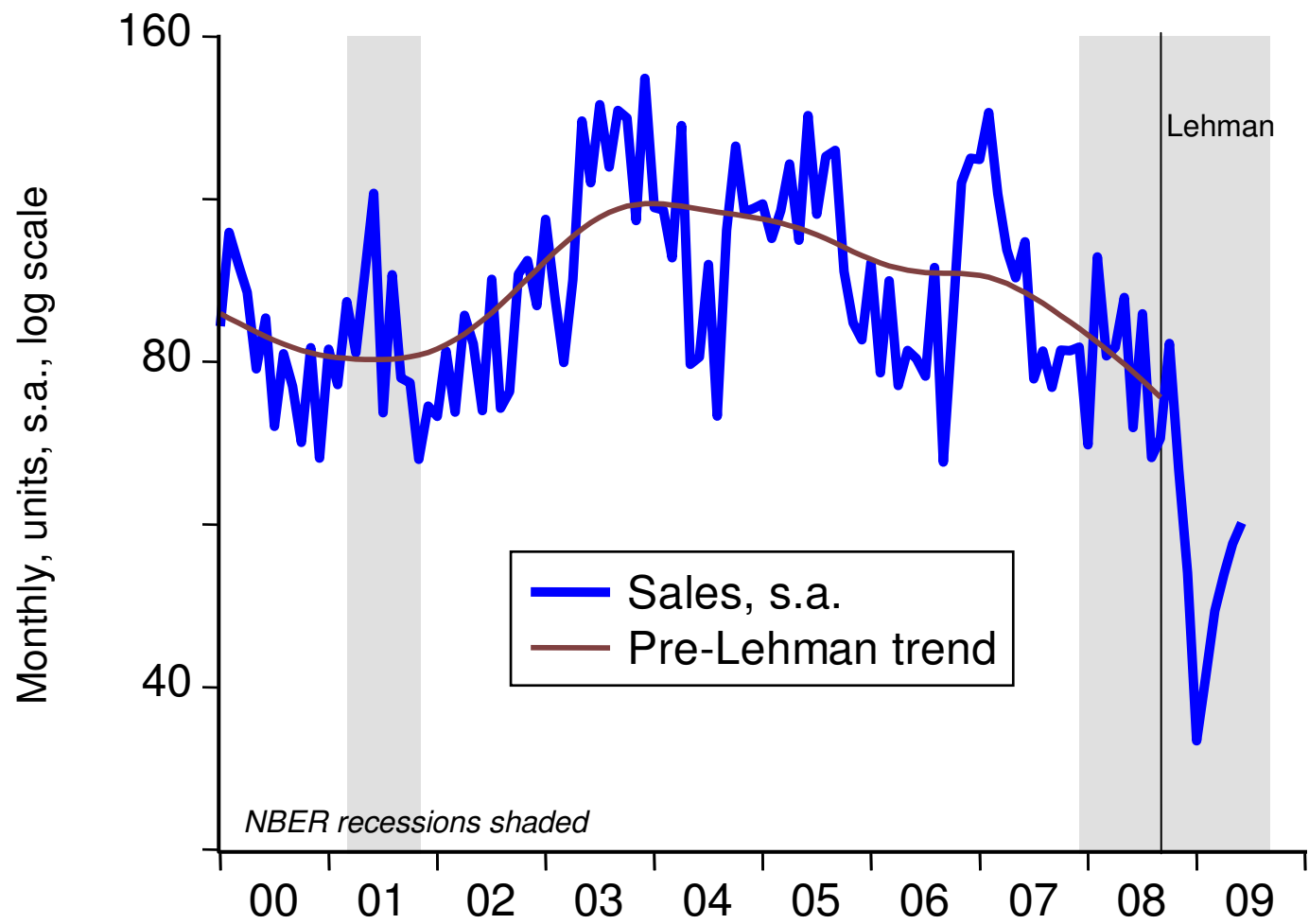
Oahu single-family home sales



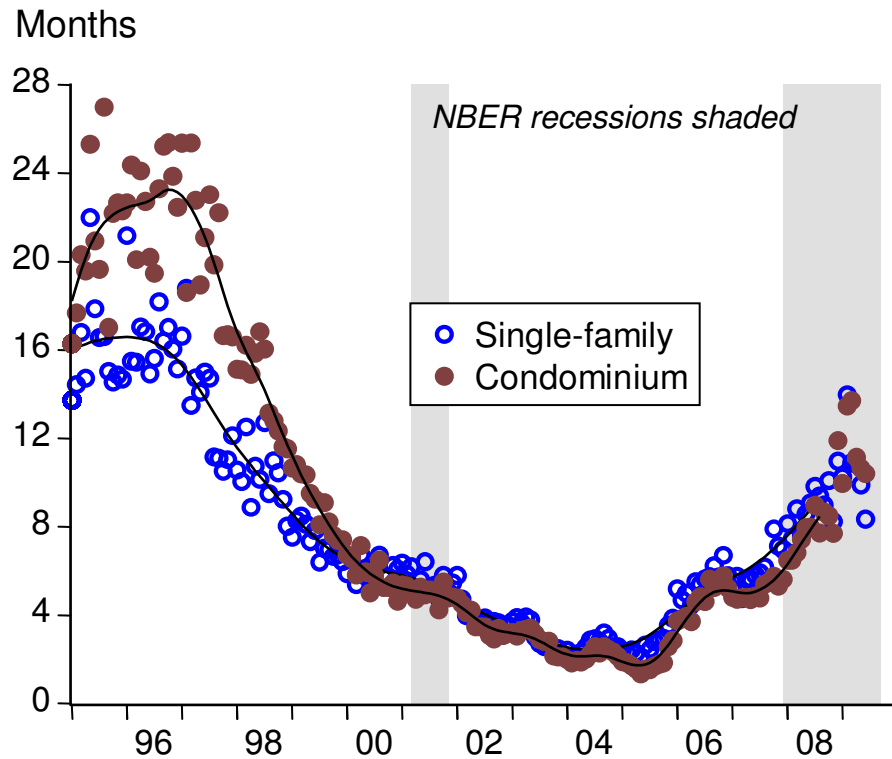
Oahu condominium sales



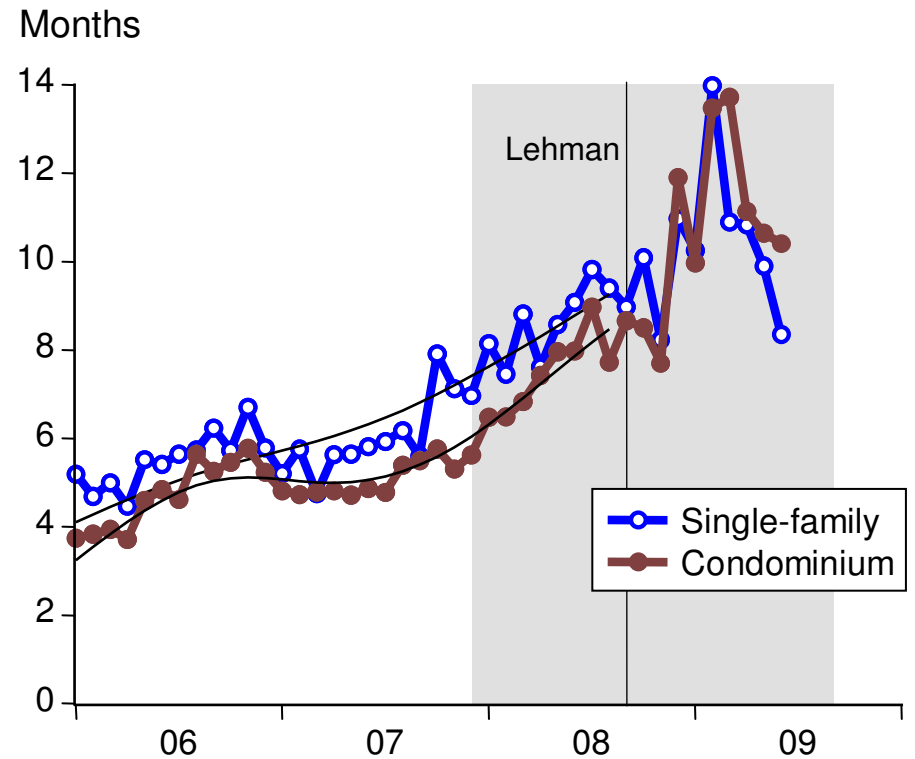
# Maui existing SF home sales



# Months of inventory remaining spike post-Lehman

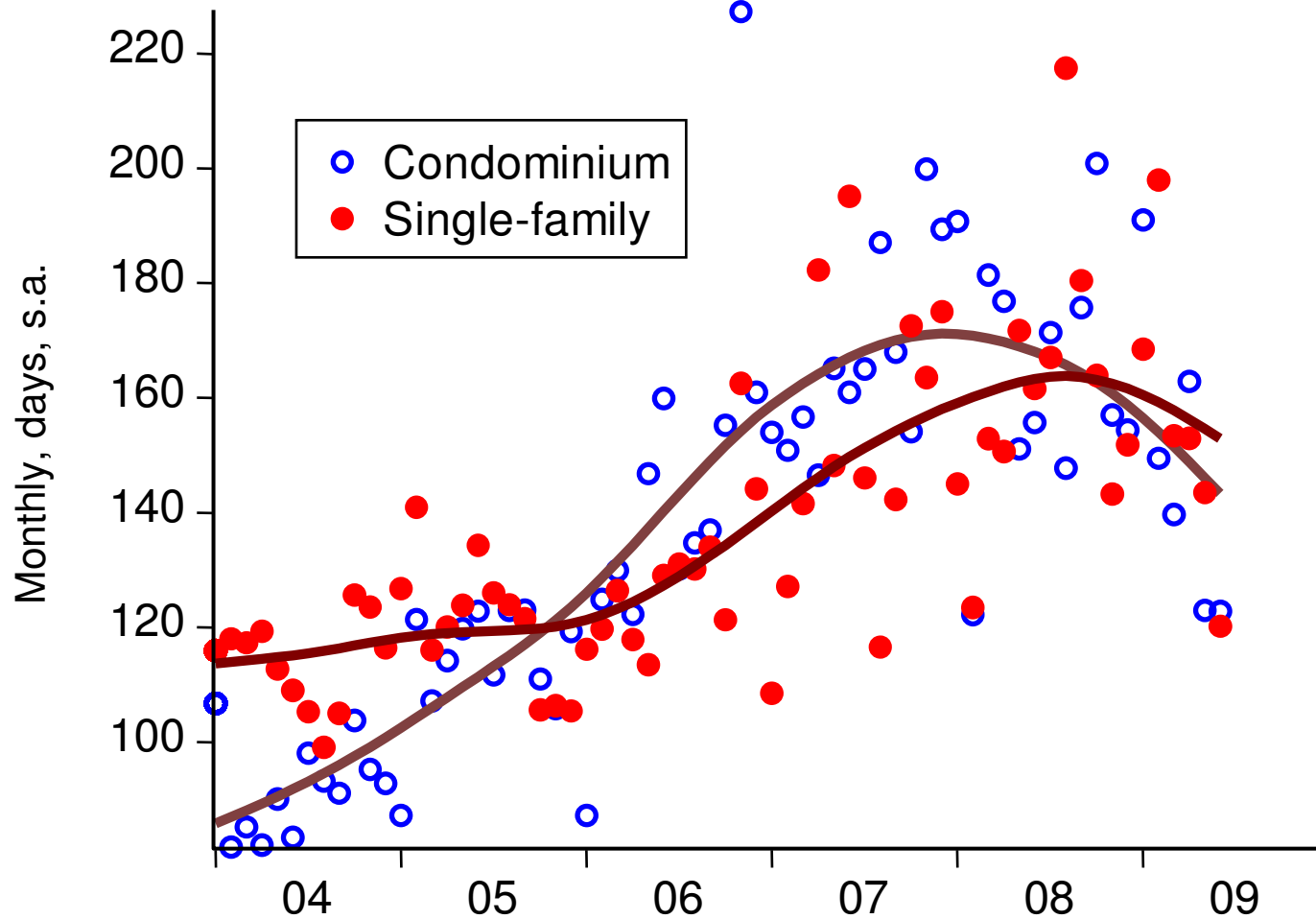


Inventory peaked in 1990s cycle  
at 1.5 to 2 years remaining



Inventory remains tight—post-  
Lehman sales drop reversed

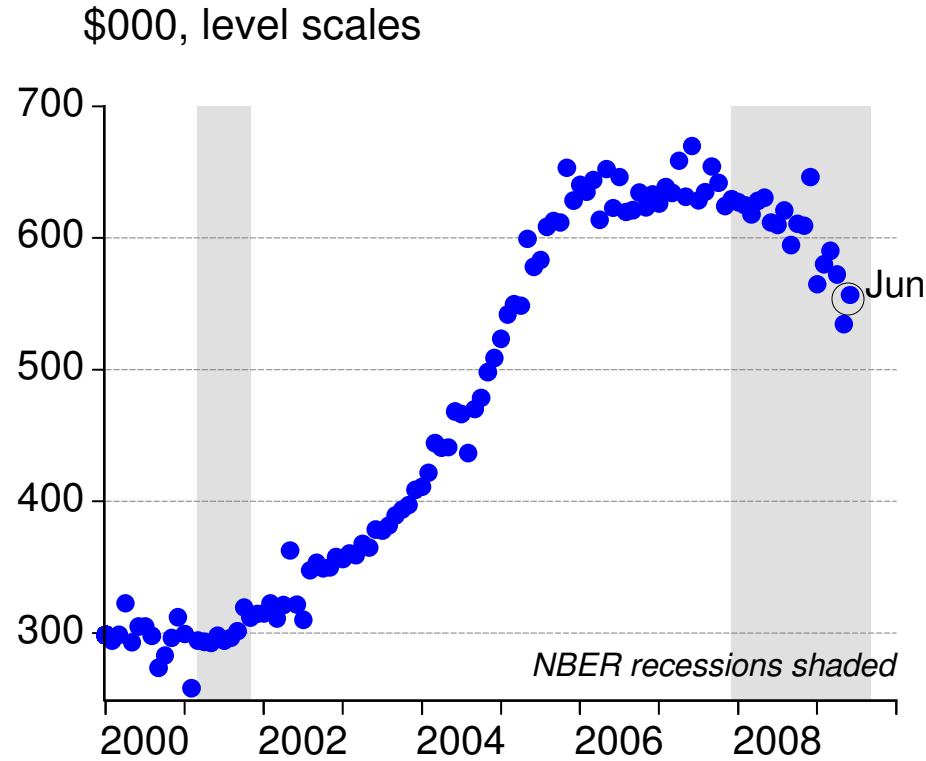
# Maui sales days on market: inventory drawdown?



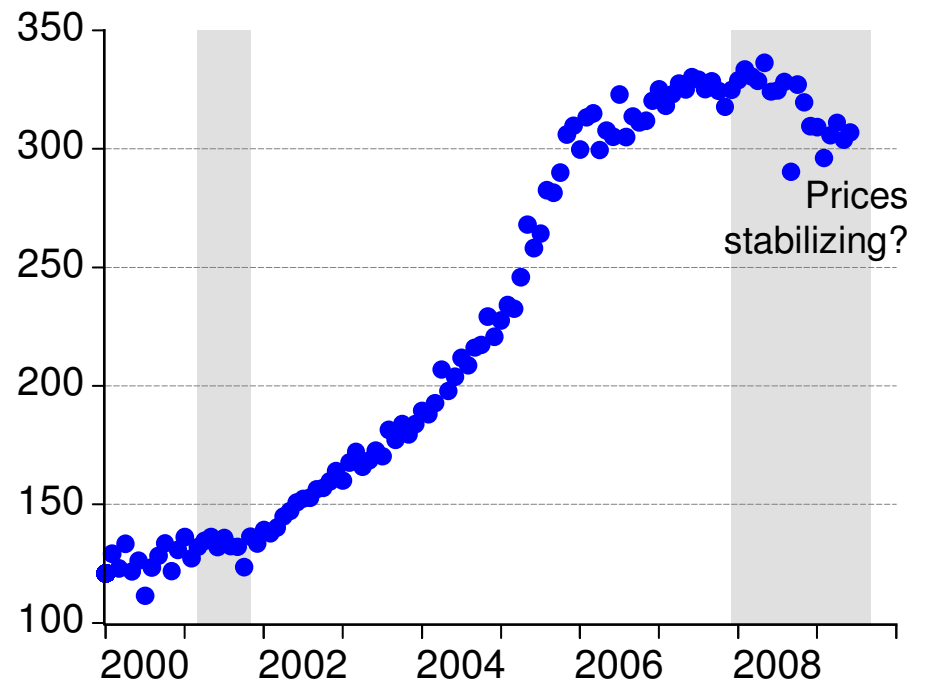
Slide copyright TZ Economics

Sources: Realtors Association of Maui; seasonal adjustment, H-P filter trend calculations by TZE

# Oahu existing home median prices

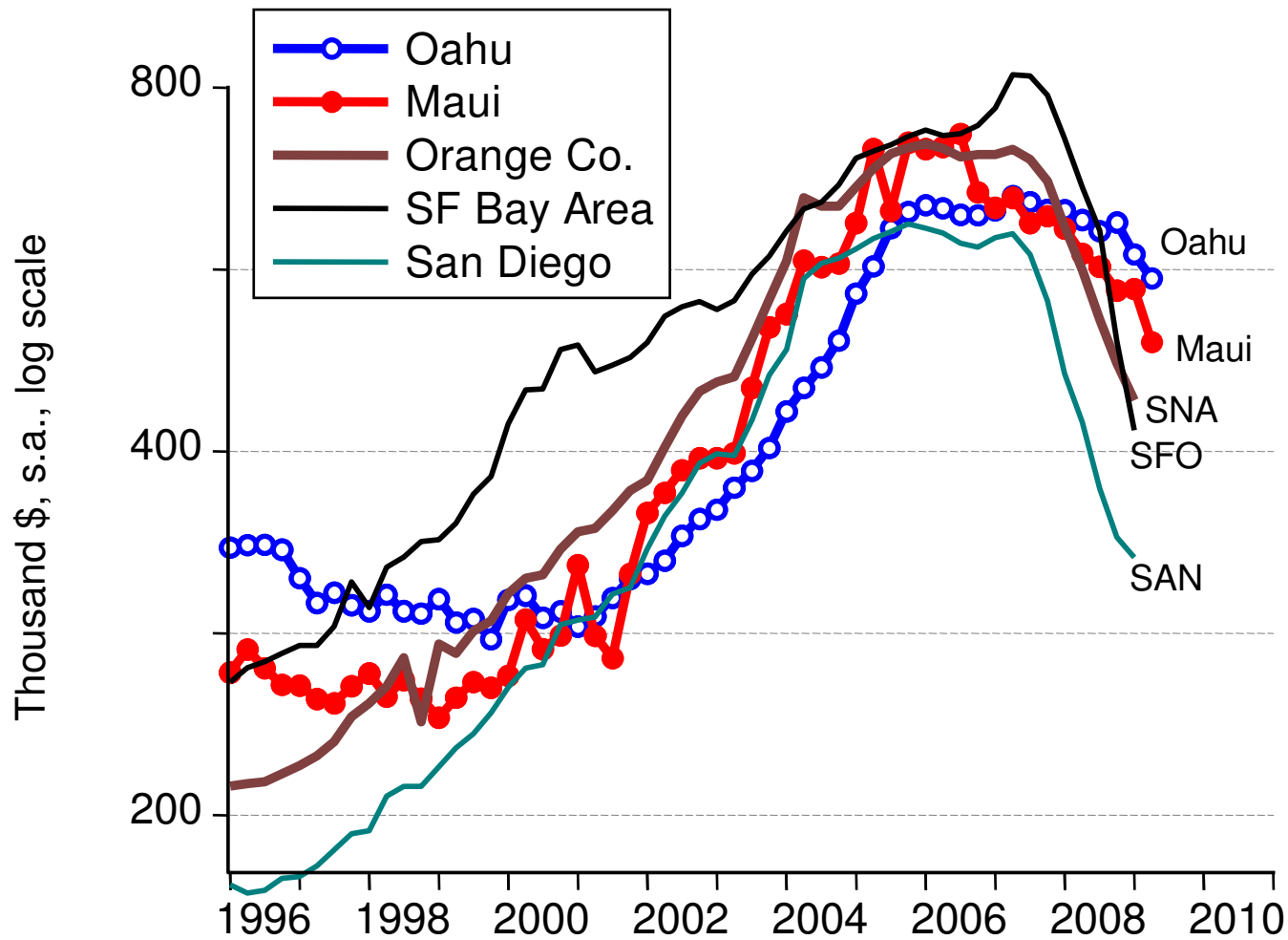


Single-family



Condominium

# CA too low or HI too high?



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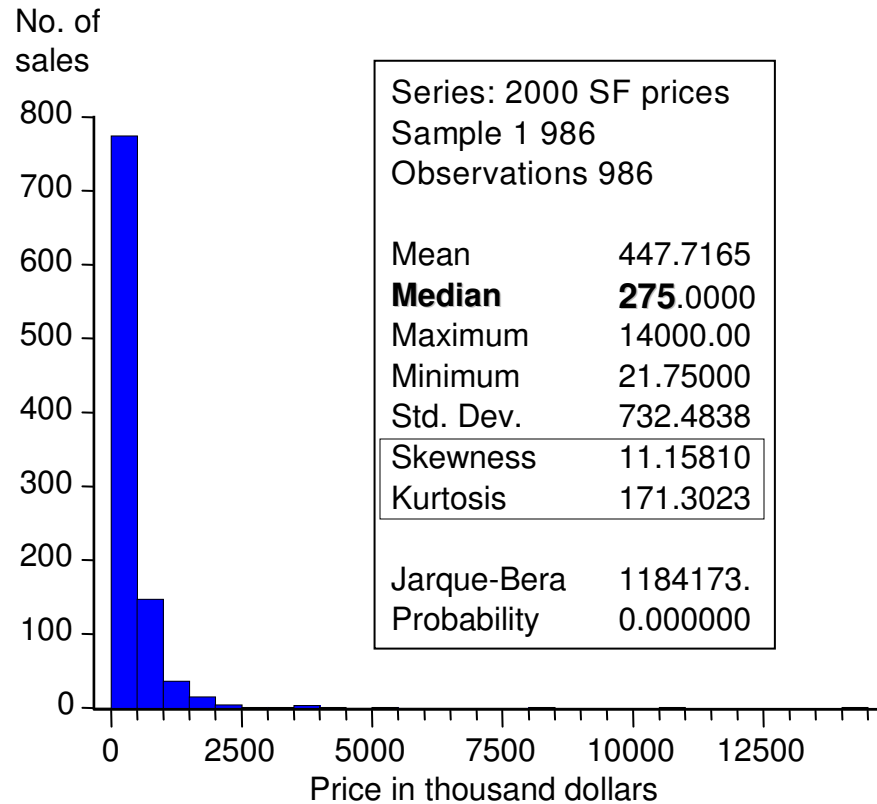
Sources: Honolulu Board of Realtors, Realtors Association of Maui, National Association of Realtors; seasonal adjustment of Hawaii data by TZ Economics



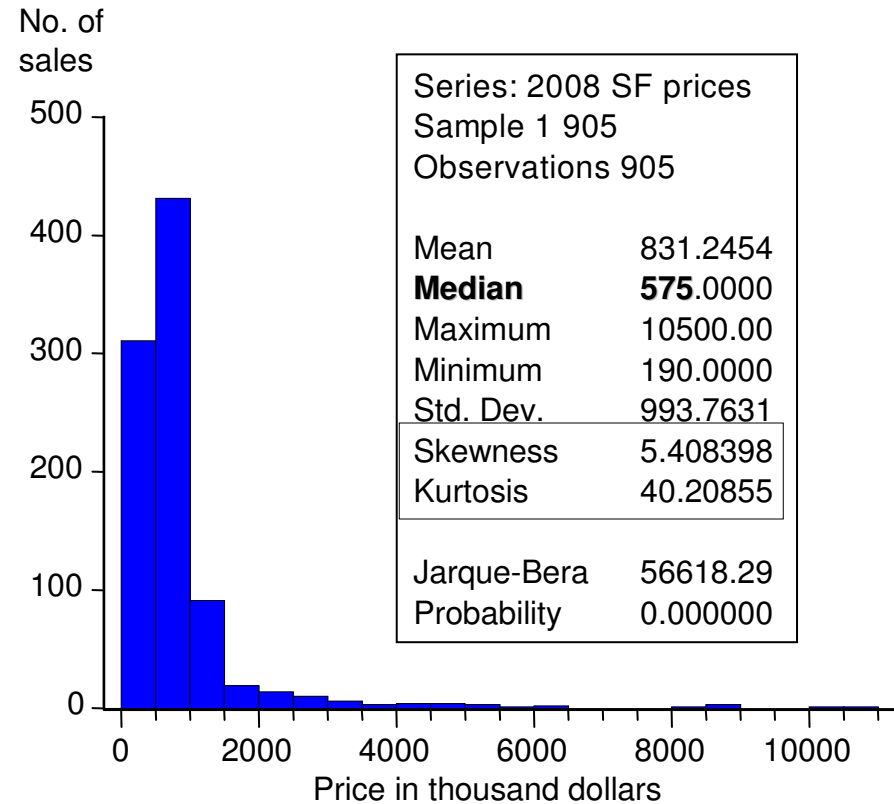
## Maui yearly price distribution checkup

- You've seen these in the past—I won't belabor the point
- Price distributions are highly skewed
- Higher-order moments of Maui's distribution informative
- Curious emergence of bi-modality, since 2004:  
Foreclosures?

# Maui's SF home price distribution



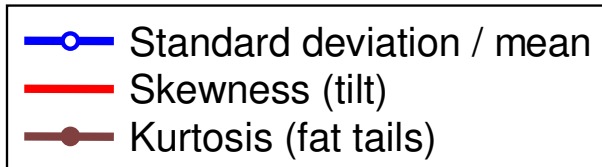
Price distribution in year 2000



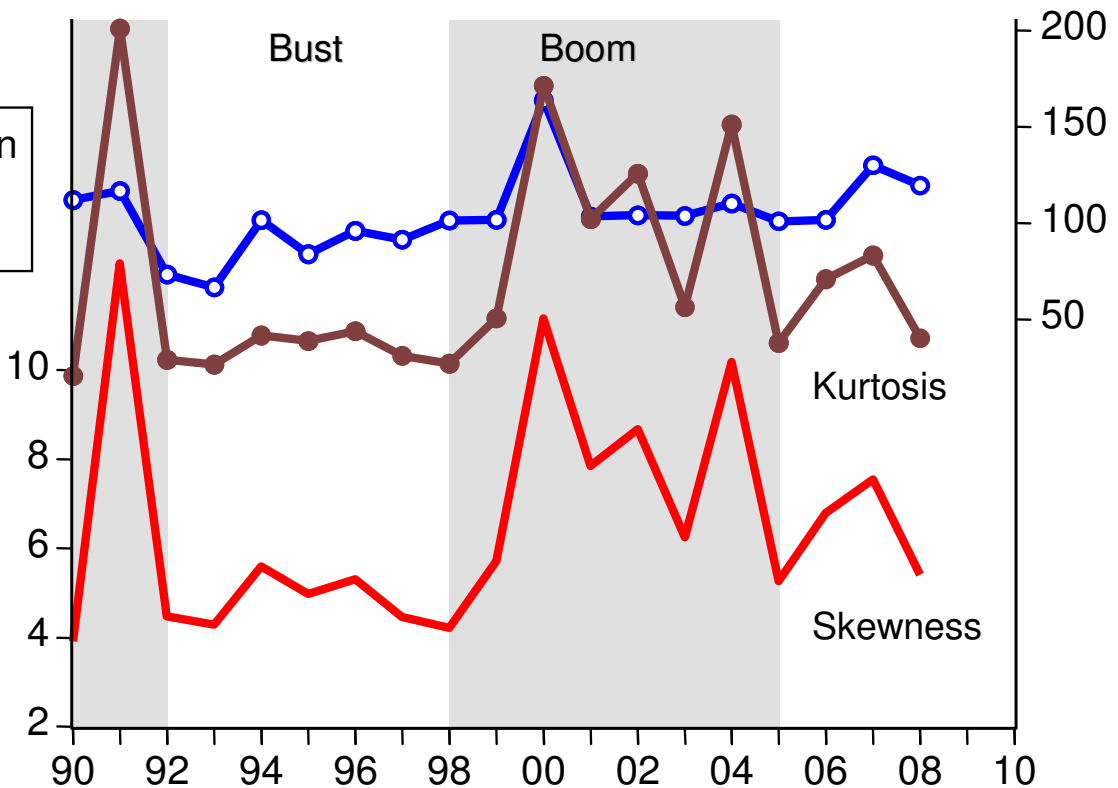
Price distribution in year 2008

# A nerdy way of thinking about boom and bust

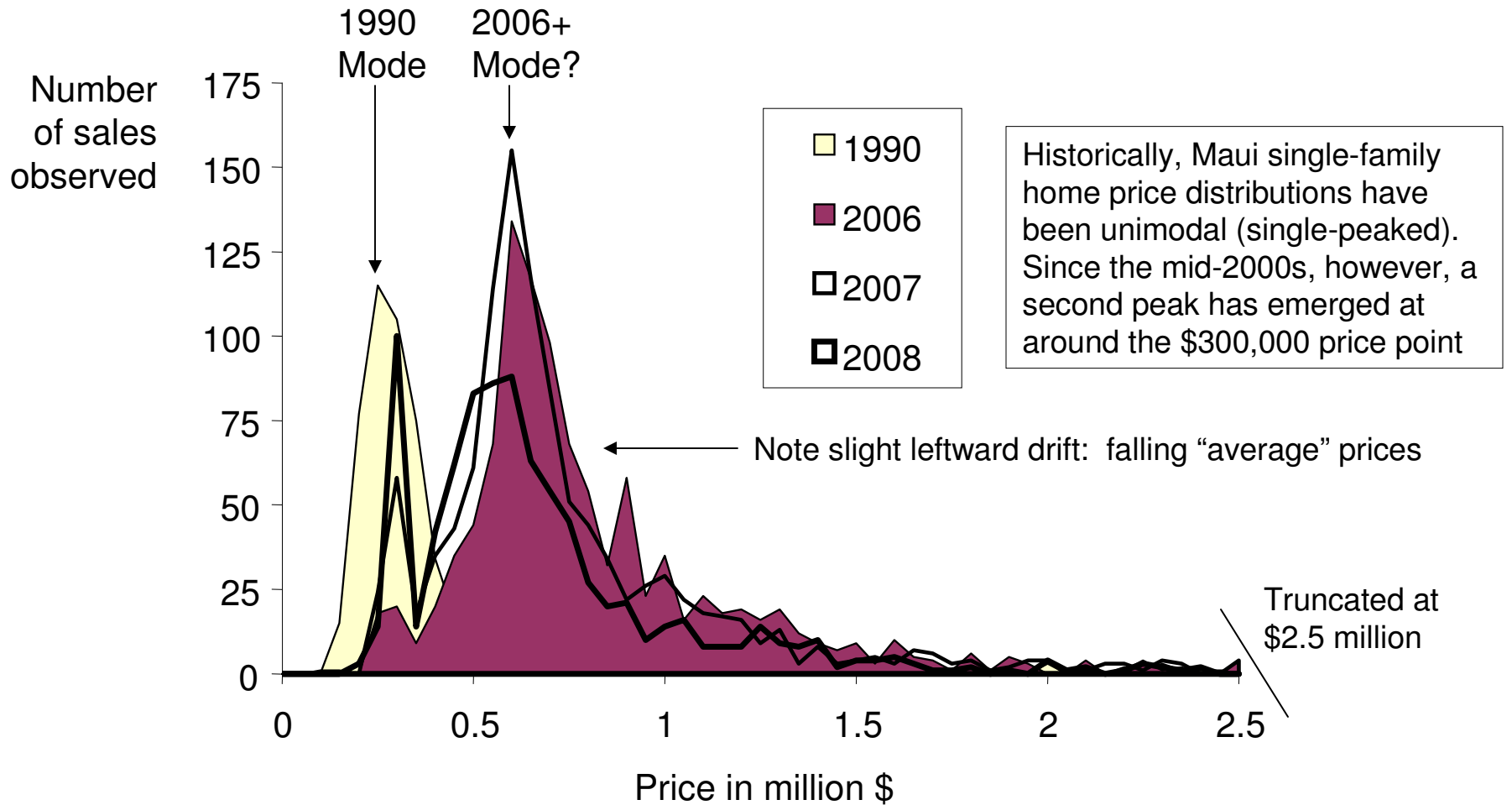
## Maui single-family home price distribution higher-order moments



On Maui, initiation of the strong phase of the home valuation cycle is associated with a sharp increase in price dispersion measures; the weak phase is associated with stable measures and a collapse at the high end of the distribution



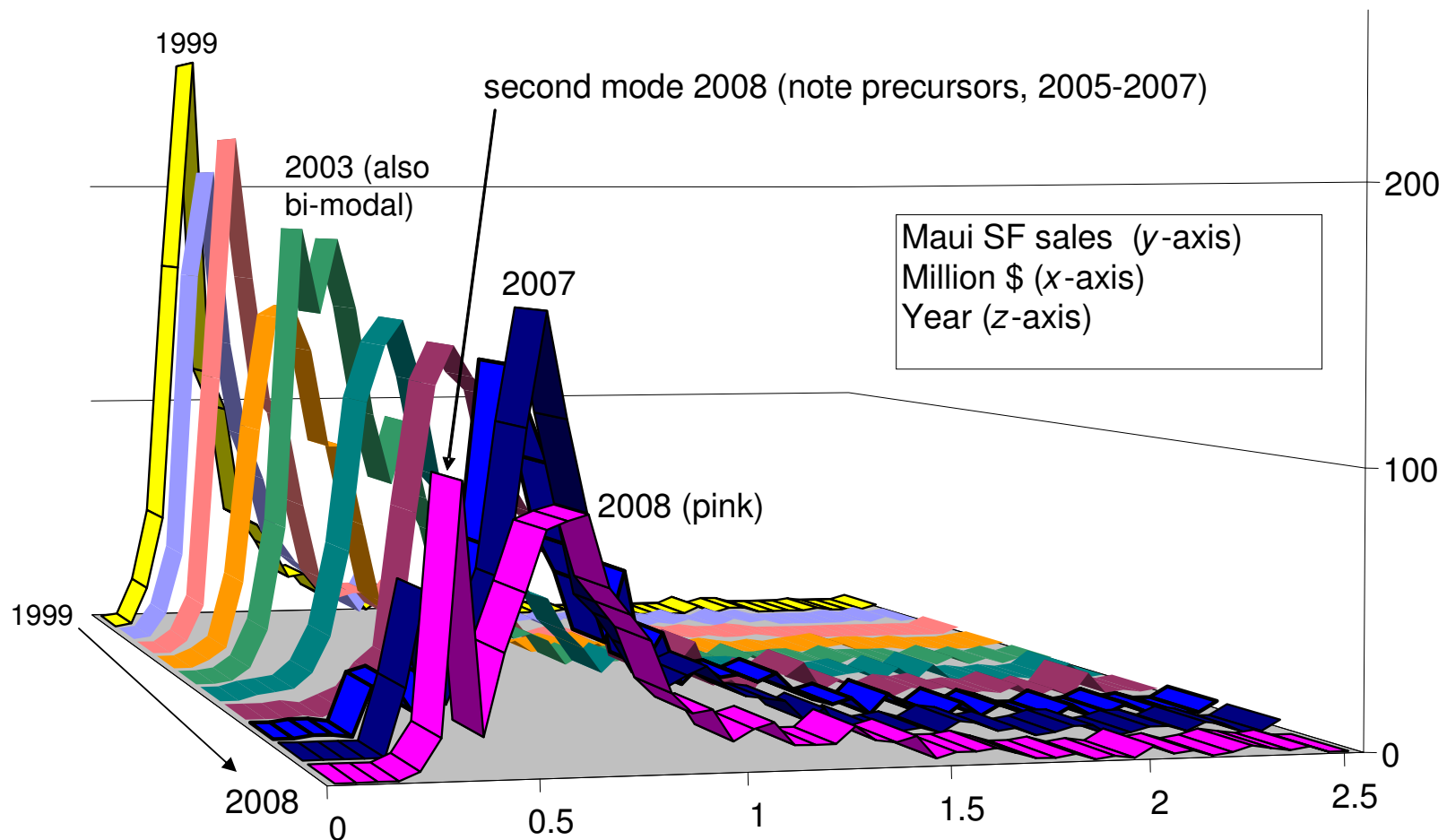
# Maui home price distributions



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Sources: Realtors Association of Maui; calculations by TZE

# Transition from uni- to bi-modal distribution in 2000s



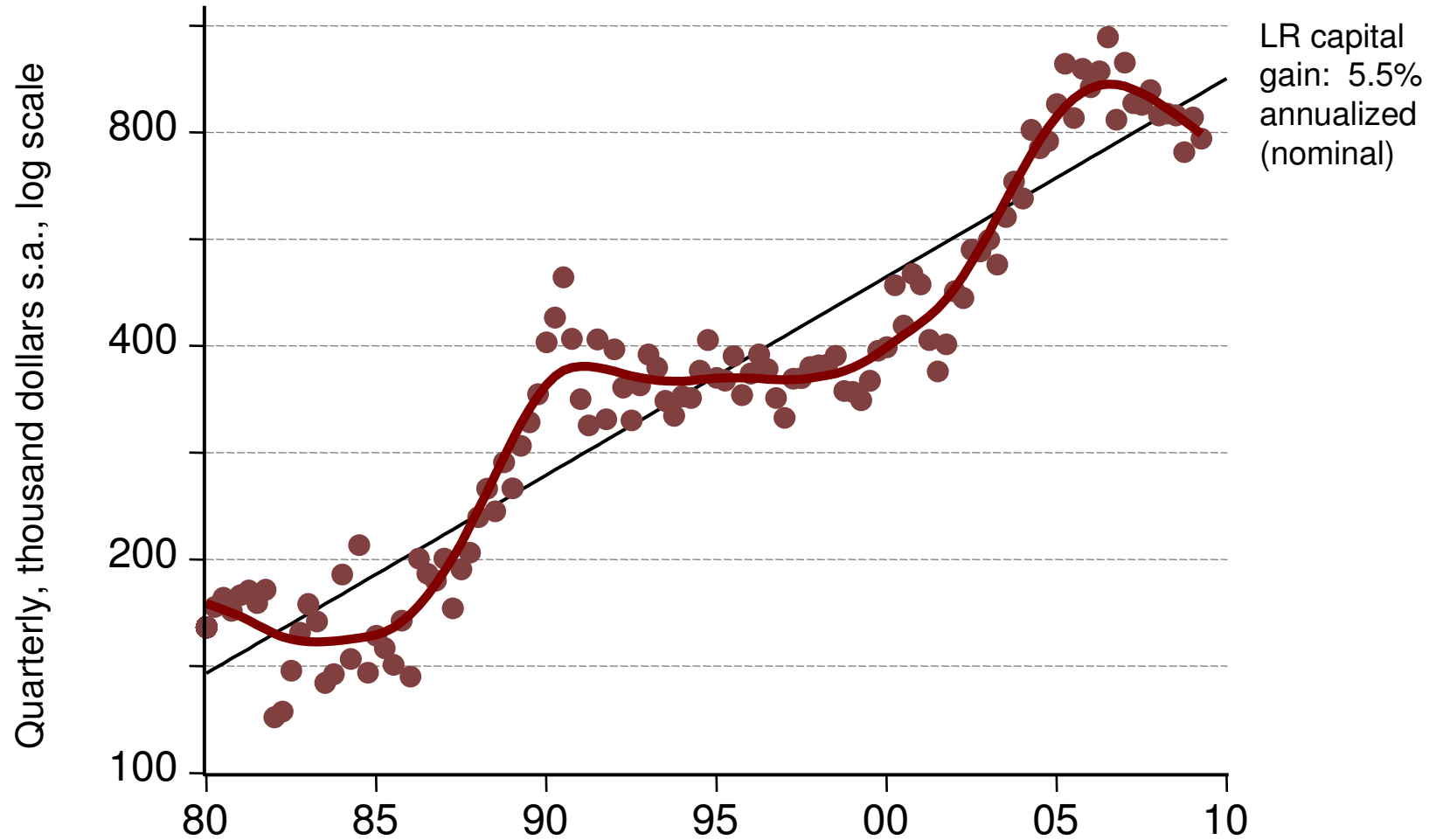
Slide copyright TZ Economics

Sources: Realtors Association of Maui; calculations by TZE



# Long-term home valuation trends

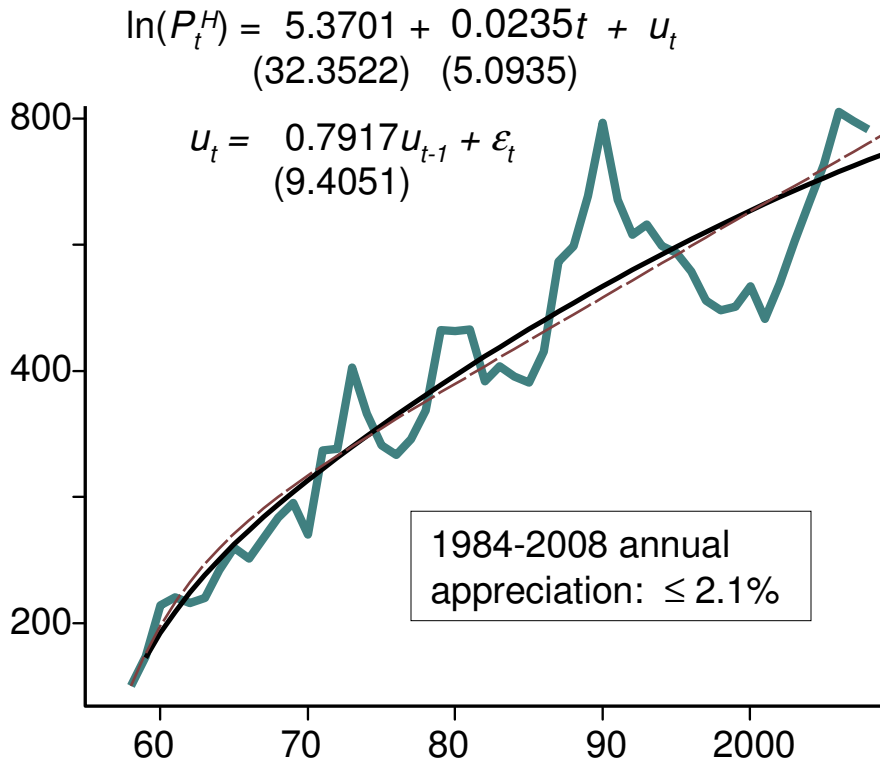
# Mean Maui existing SF home sales prices



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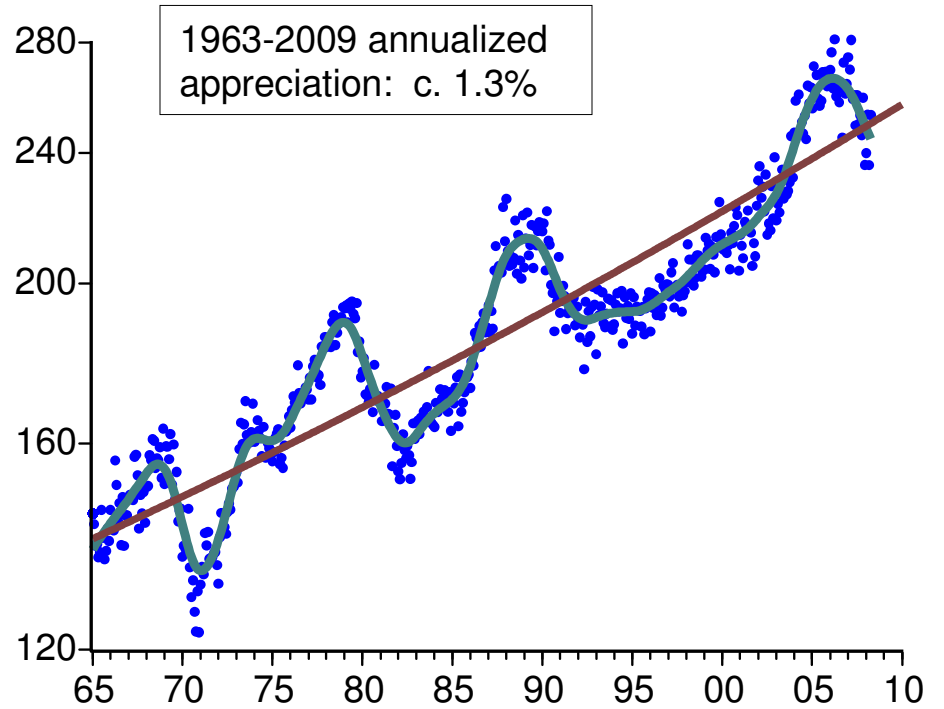
Sources: UHERO, Realtors Association of Maui; seasonal adjustment, H-P filter trend and log trend calculations by TZE

# Asset-pricing bubbles not uncommon



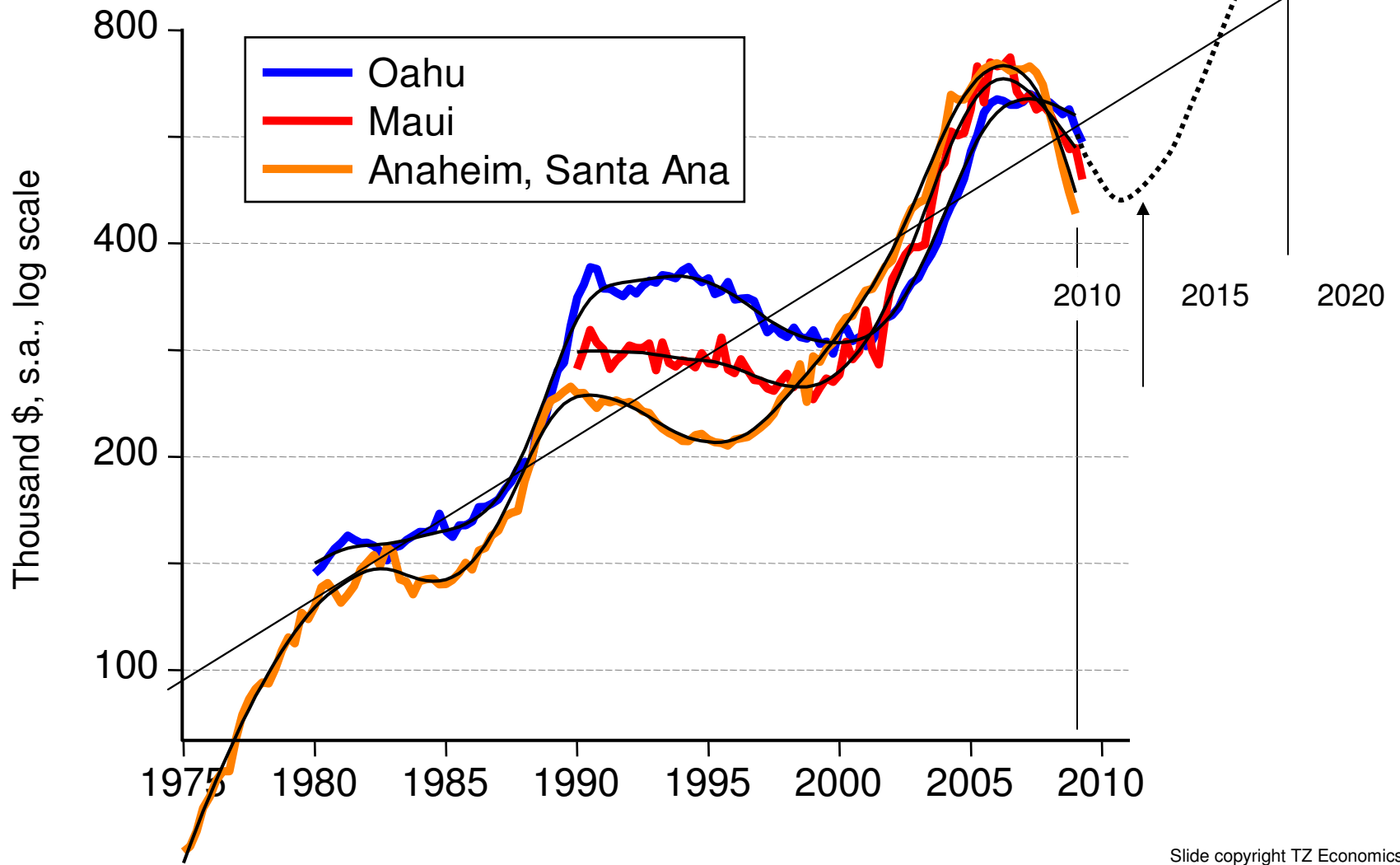
Mean Oahu *existing* SF home prices

Hawaii could plausibly experience another housing “bubble” in the 20-teens



Median U.S. *new* SF home prices

# Who's worth most in LR equilibrium?

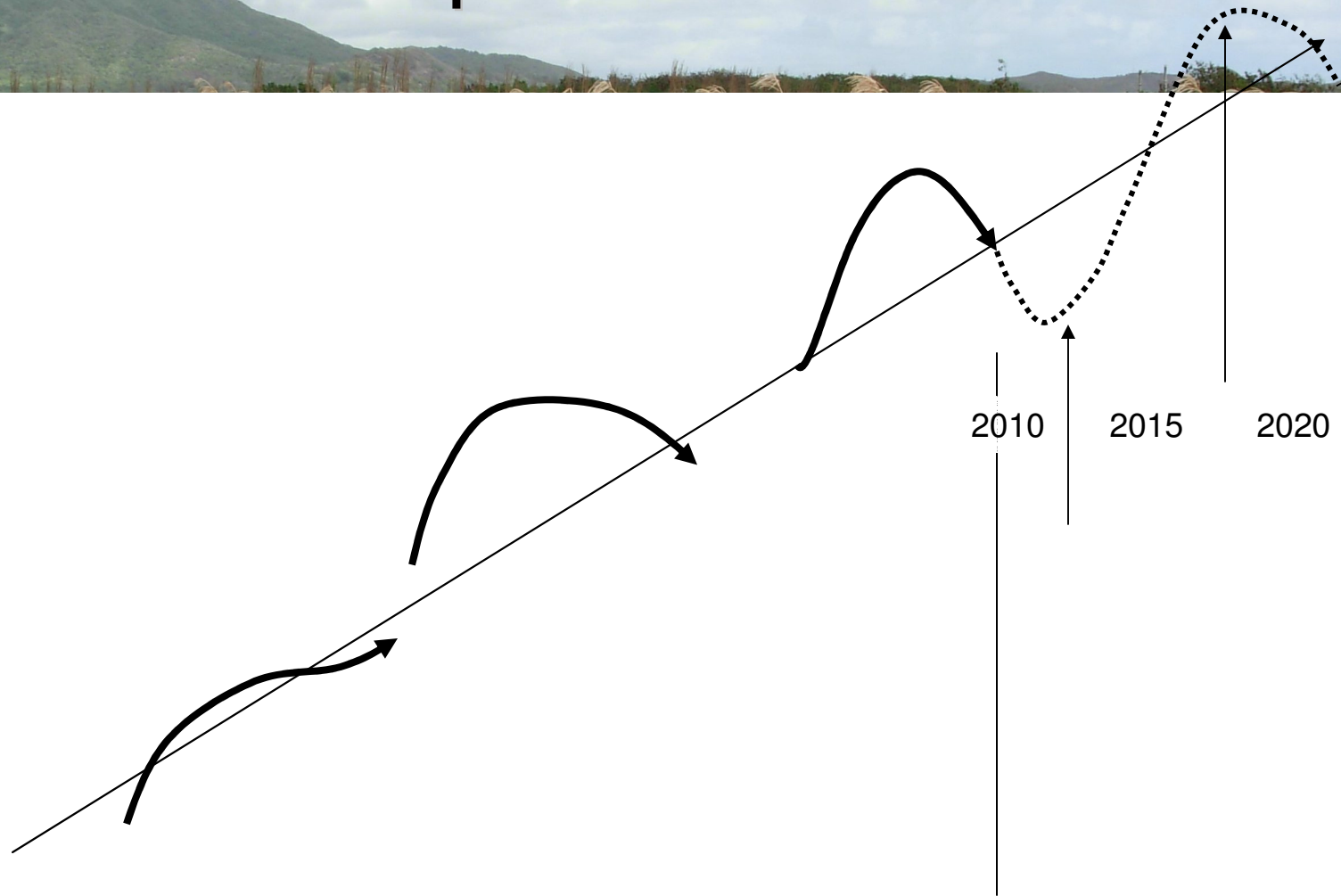


Slide copyright TZ Economics

Sources: Honolulu Board of Realtors, Realtors Association of Maui, National Association of Realtors, Mike Sklarz, Prudential Locations; seasonal adjustment of Hawaii data by TZ Economics

# Who's worth most in LR equilibrium?

Thousand \$, s.a., log scale



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Sources: Honolulu Board of Realtors, Realtors Association of Maui, National Association of Realtors, Mike Sklarz, Prudential Locations; seasonal adjustment of Hawaii data by TZ Economics



*Pau*



## Appendix 1: Economic policy topics

- Christina Romer (Obama CEA) on ARRA
  - Twice the size of the New Deal (1934); 3% vs. 1½% of GDP
  - ¾ of stimulus spend out in 18 months (CBO)
  - Tax cuts (+AMT), support to states, infrastructure, energy, education
  - Romer<sup>2</sup> research: tax cut multiplier  $\approx 1.0$ ; spending multiplier  $\approx 1.6^*$
  - “Estimates almost surely more likely to [be] biased downward”
  - Inherited deficit  $\Rightarrow$  need for credible long-run fiscal solutions
- Doug Holtz-Eakin (ex-CBO): “missing an exit strategy”
  - Fiscal stimulus is something you “turn on” and “turn off”
  - “Temporary” interventions will simply not unwind on their own
  - “Very high degree of difficulty 180° pirouette to be made ‘in public’”
  - Public believes Washington and Wall Street failed, want bums out
  - Legacy of the “Rick Santelli ‘revolution’”: good solutions not popular

Romer link: [http://www.whitehouse.gov/administration/eop/cea/speeches\\_testimony/03032009/](http://www.whitehouse.gov/administration/eop/cea/speeches_testimony/03032009/) Holtz-Eakin speech viewable on-line, link at “Opposing View”: <http://www.nabe.com/video.html>. On financial crises see also Carmen Reinhart and Kenneth Rogoff ([http://www.economics.harvard.edu/files/faculty/51\\_Aftermath.pdf](http://www.economics.harvard.edu/files/faculty/51_Aftermath.pdf) and [http://www.economics.harvard.edu/faculty/rogoff/files/ls\\_The\\_US\\_Subprime\\_Crisis\\_So\\_Different.pdf](http://www.economics.harvard.edu/faculty/rogoff/files/ls_The_US_Subprime_Crisis_So_Different.pdf), as well as slideshow at <http://nabe.com/pc09/documents/Reinhart.pdf>. Governor Kohn reports multipliers “around 2” if stimulus is expected to be temporary and monetary policy holds short-term interest rates at the zero lower bound including crowding-out effects (<http://www.federalreserve.gov/newsevents/speech/kohn20090523a.htm>).

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# Financial reforms

- Among many origins of financial crisis:
  - Regulatory arbitrage—book assets off balance sheet, via conduits
  - Maturity mismatches—riding the yield curve on overnight repos
  - Violation of Taylor Rule mixed with Asian demand for Treasuries
  - “Affordable housing” pressure on GSEs, rating agencies
  - Bank stock ownership limitations that impede corporate governance
  
- Six reform ideas (Calomiris)
  - Smarter “micro prudential” regulation of banks
  - Eliminate distortions in housing finance that encourage leveraging
  - Improve stockholder discipline of banks
  - Counterparty “netting” and OTC transparency
  - Prepackaged “bridge bank” plans for large, complex financials
  - “Macro prudential” regulation of bank capital and liquidity standards

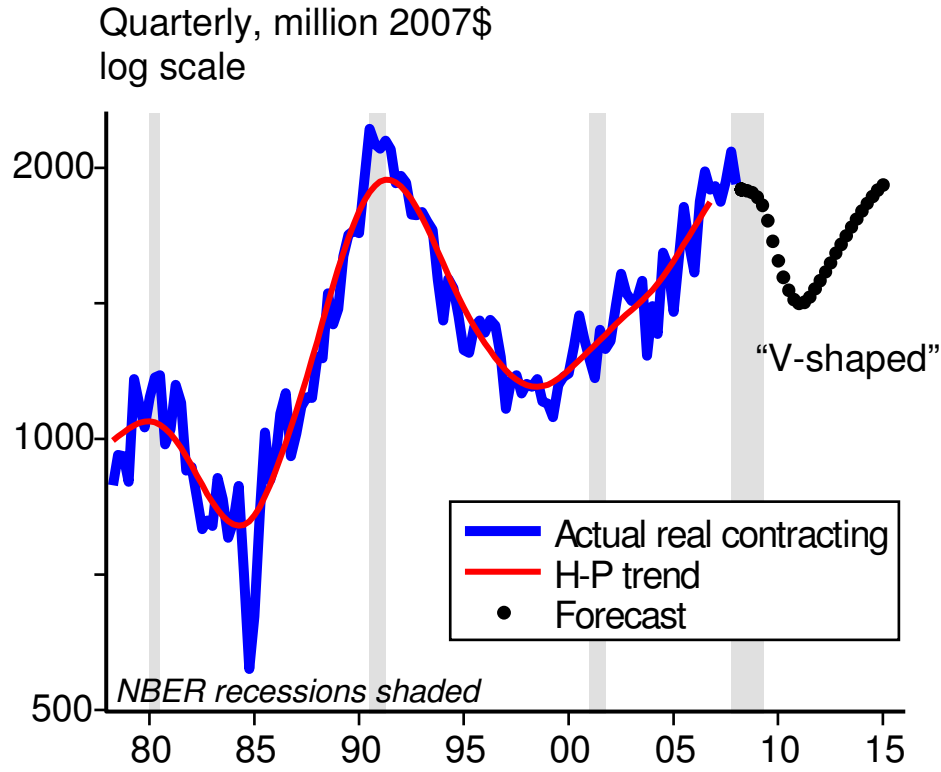


## Someone to think about the big picture

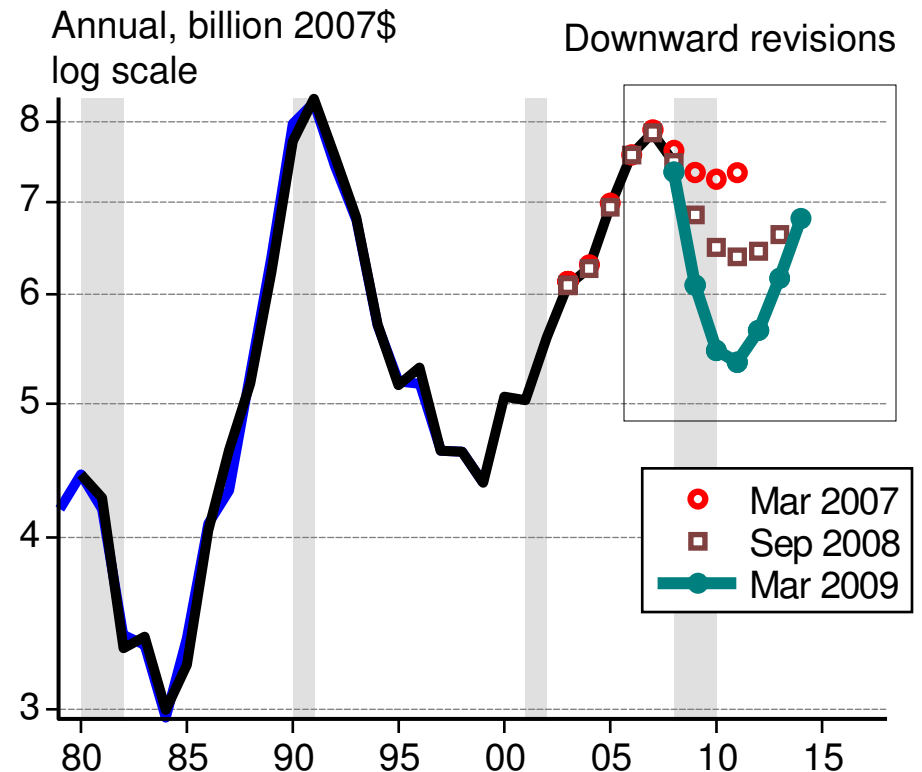
- Macro prudential regulation
  - Time-varying parameters (capital, liquidity, provisioning policies)
  - Increase requirements to tamp down asset price “bubbliciousness”
  - Form new regulator: Federal Reserve has its hands full
  - Problem identifying bubbles: false positives
  - Orderly resolution of systemically-embedded financial institutions

Charles Calomiris’s views are also developed in an April 2009 working paper, <http://www0.gsb.columbia.edu/faculty/ccalomiris/papers/PrudentialBankRegulation.pdf>; see also Markus Brunnermeier’s *Journal of Economic Perspectives* article [http://www.princeton.edu/~markus/research/papers/liquidity\\_credit\\_crunch.pdf](http://www.princeton.edu/~markus/research/papers/liquidity_credit_crunch.pdf), and materials from panel discussion at the NABE spring policy conference with Calomiris at [http://www.nabe.com/pc09/documents/Brunnermeier02b\\_NABE\\_2009\\_Brunnermeier.pdf](http://www.nabe.com/pc09/documents/Brunnermeier02b_NABE_2009_Brunnermeier.pdf).

# Appendix 2: Hawaii construction forecasts

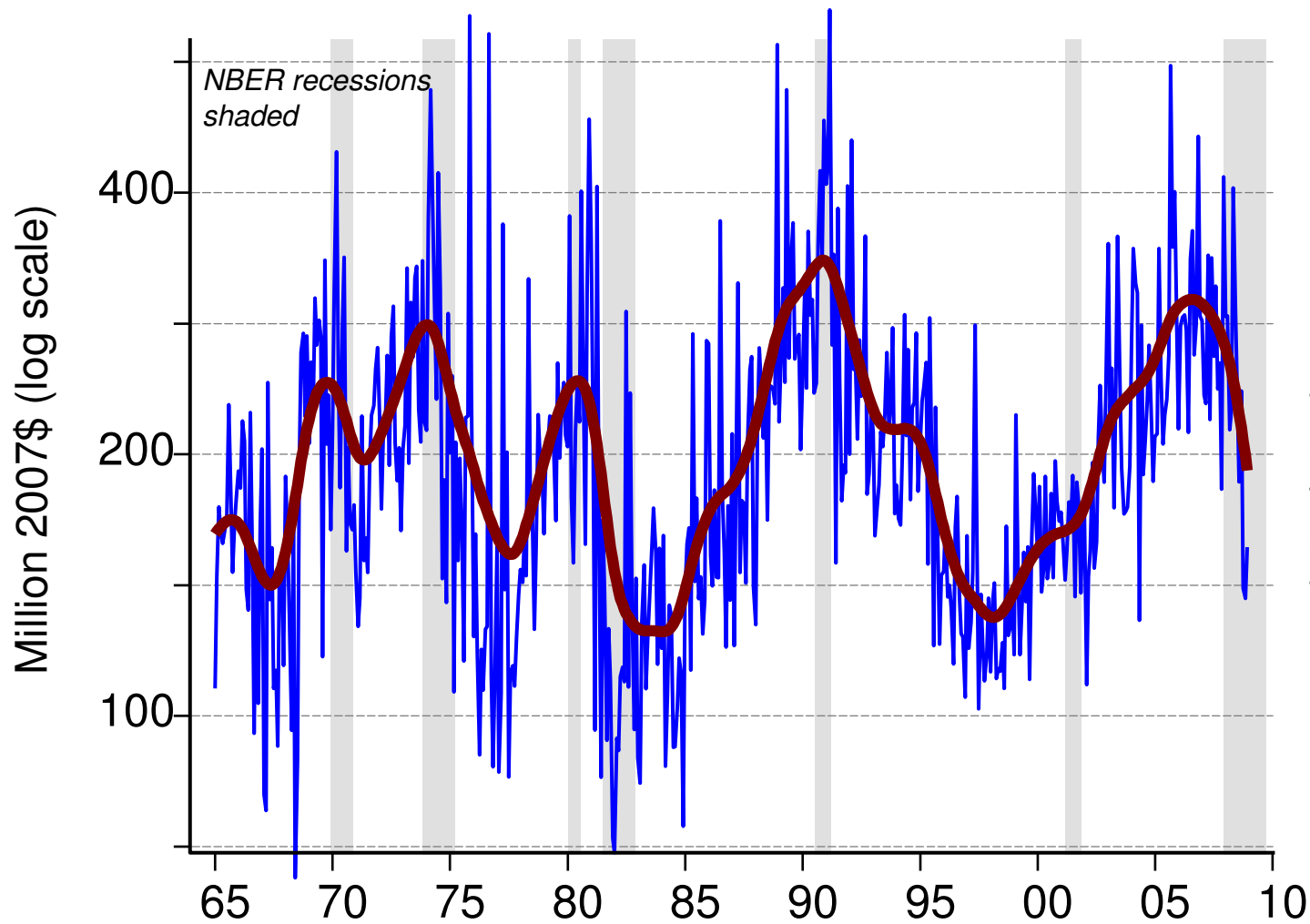


Brewbaker (COR) Jan 2009



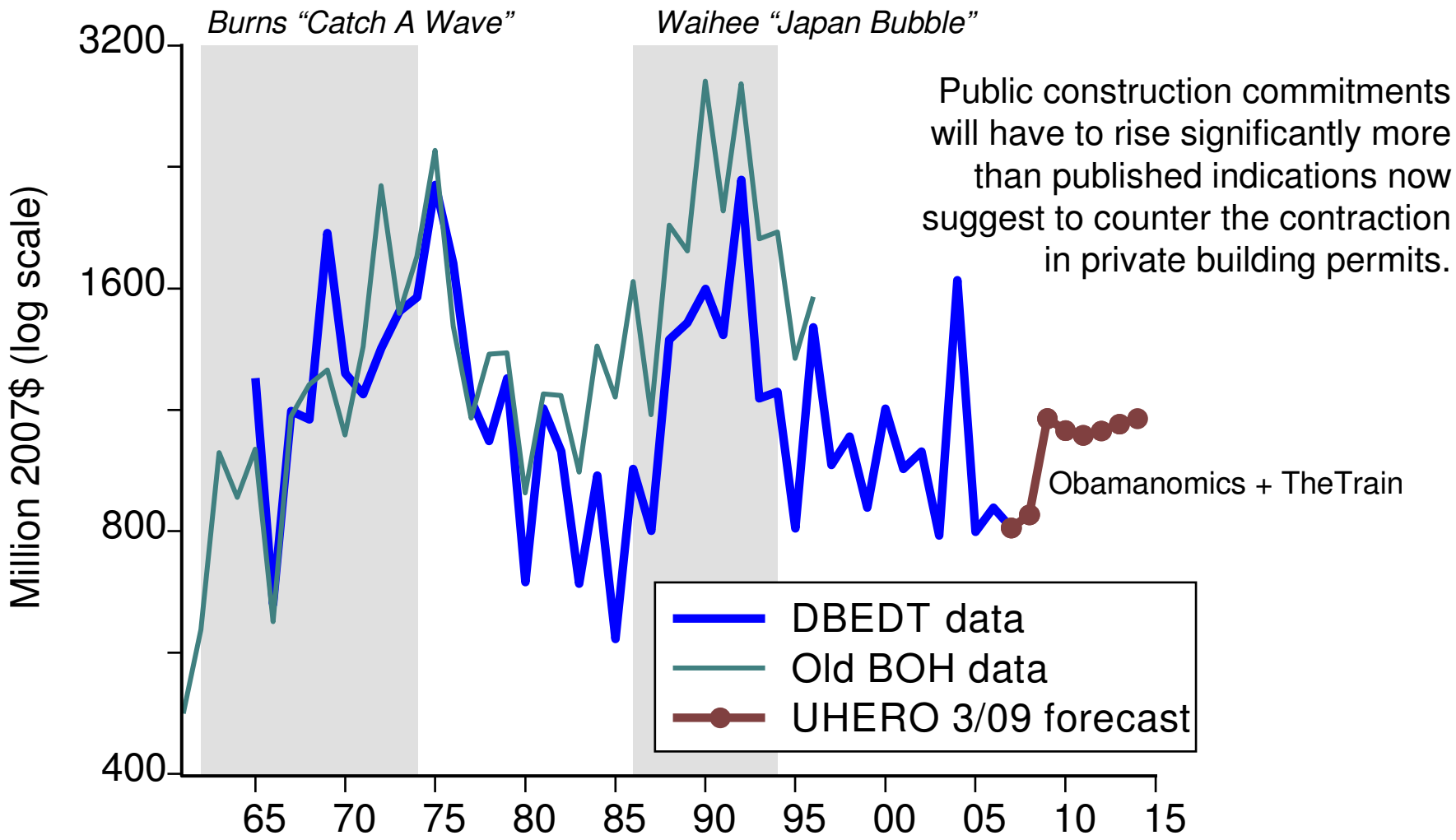
UHERO Mar 2009

# Real private building permit values



On trend, Hawaii private construction authorizations have fallen back about one-third of the way to the previous cyclical trough, but farther at the margin.

# Public investment “stimulus”



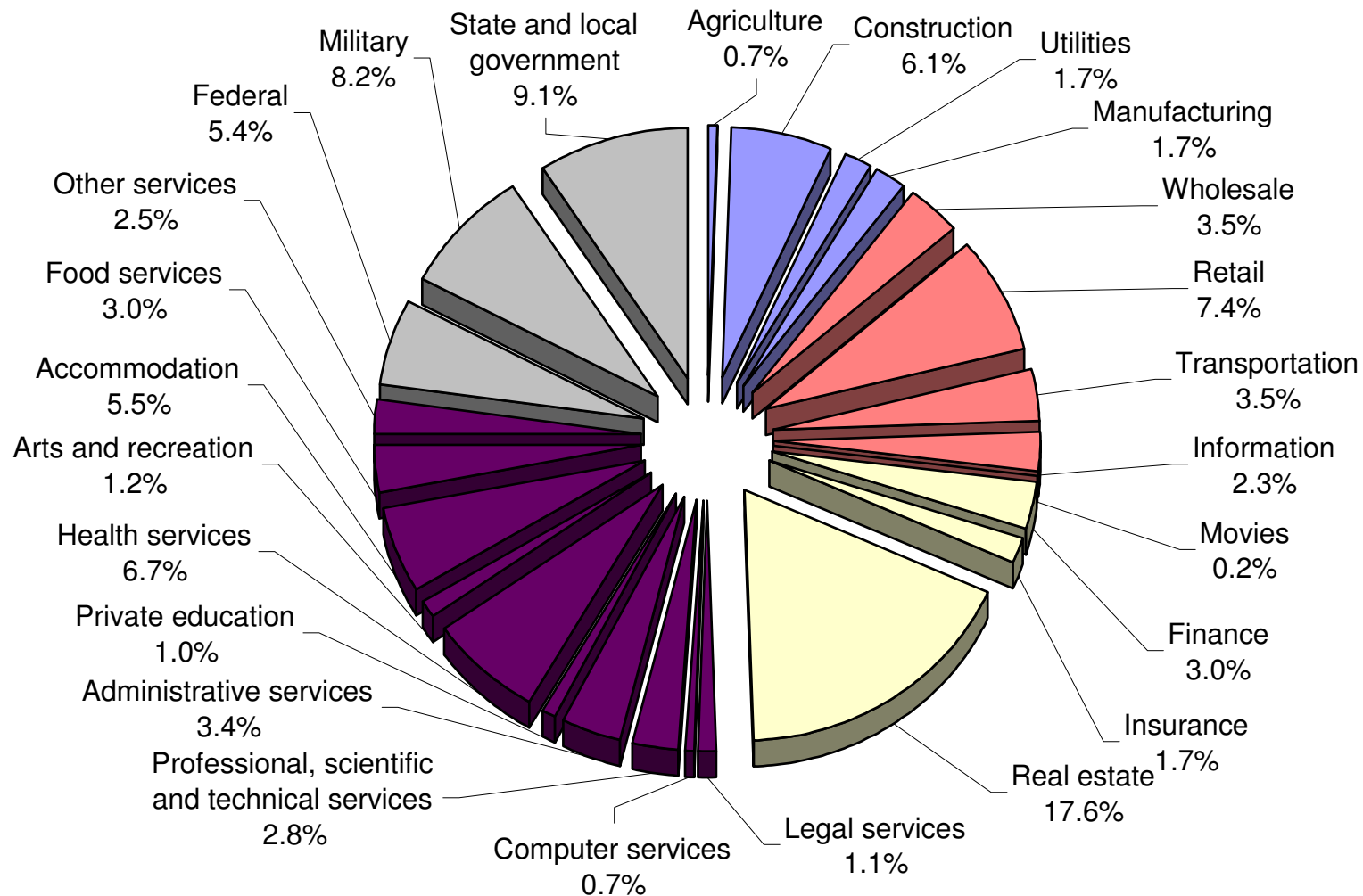
Sources: Hawaii DBEDT, UHERO; TZ Economics



## Appendix 3: structure of Hawaii economy

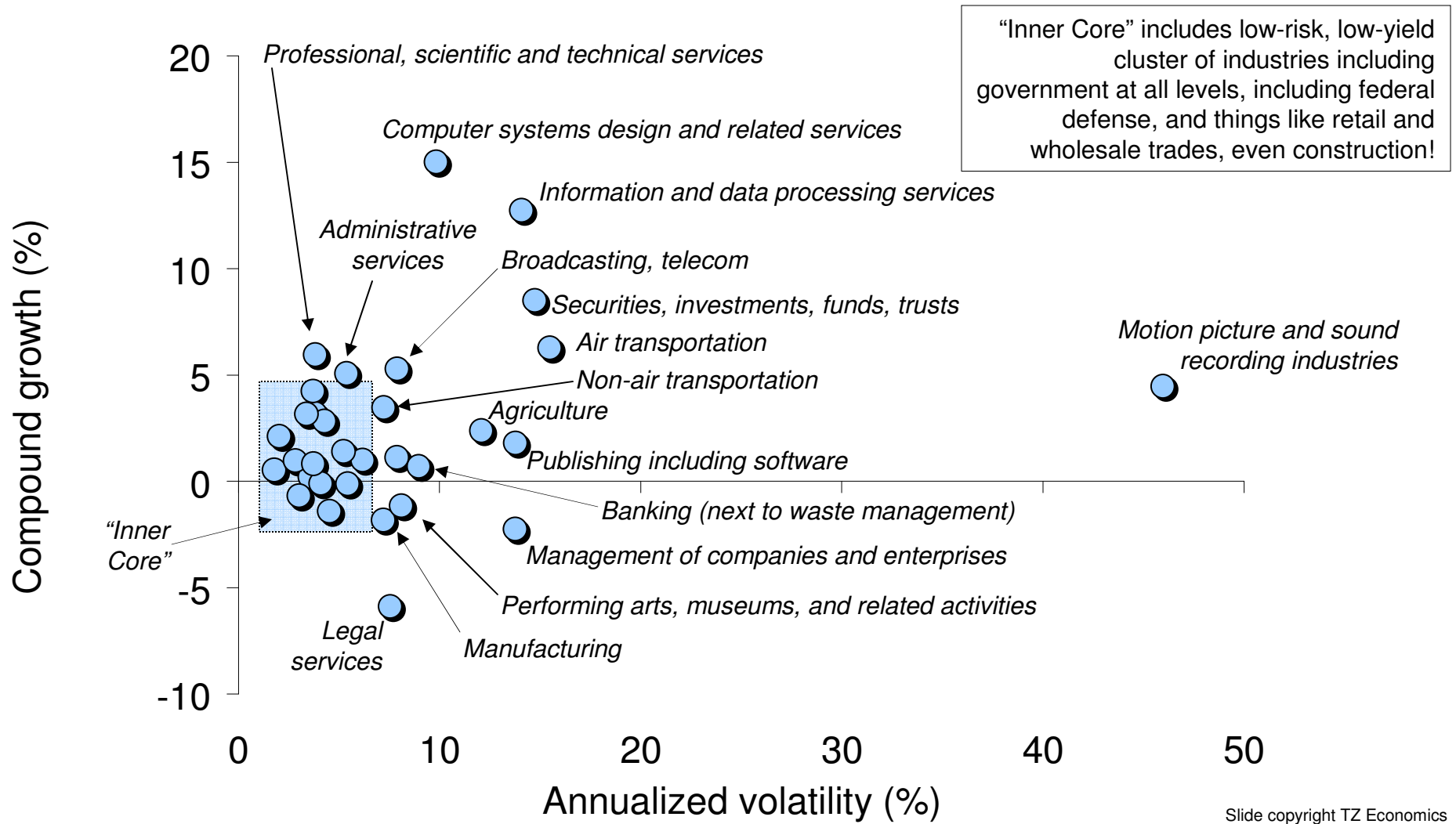
- Big debate in Hawaii: how to diversify the economy
- ...as if we had a choice
- Small open economies take global prices as given, maximize their social welfare by specializing in production in their comparative advantage, trading that with the rest of the world— translation: Ross is cheaper for a reason
- Given discretion we should maximize risk-adjusted returns

# Hawaii gross product by NAICS industry, 2006



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# Hawaii gross product by industry: growth and volatility



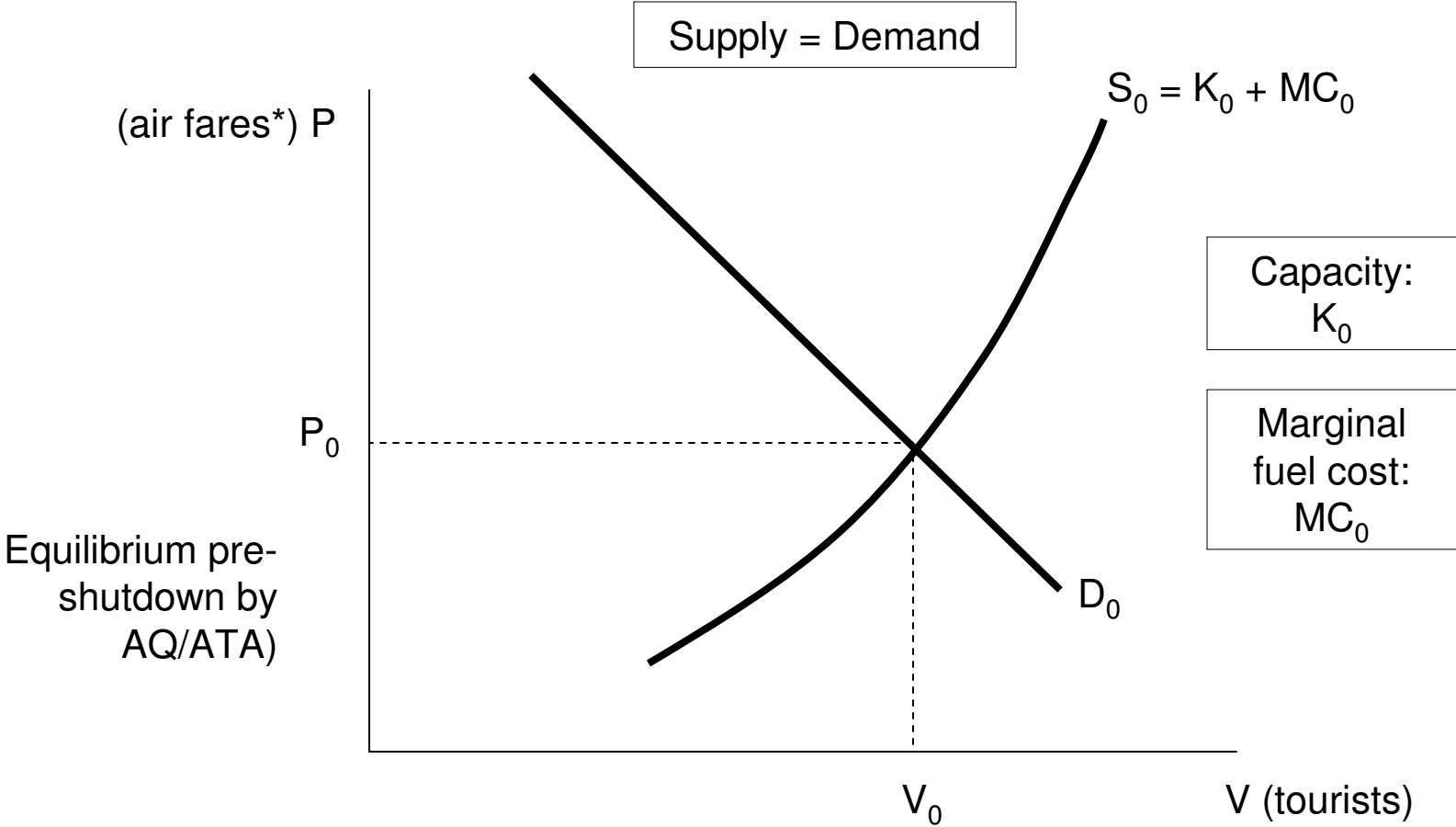
Sources: Bureau of Economic Analysis, US Department of Commerce; calculations by TZE



## Appendix 4: tourism supply and demand

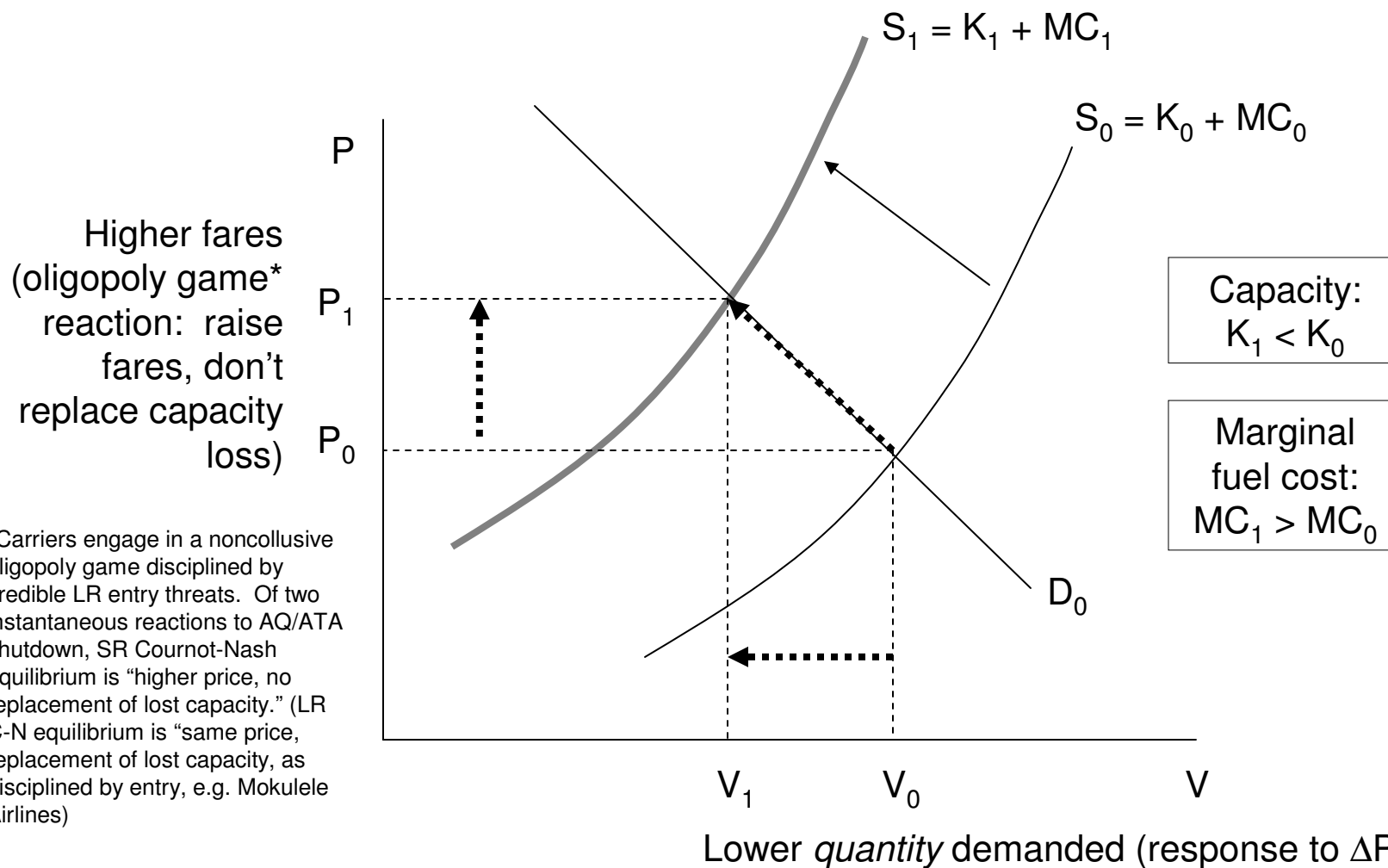
- Just think through “supply and demand”
- Airline shutdowns were a “supply contraction” comprising 20 percent of inbound domestic lift
- Simultaneously, rising petroleum prices lifted aviation fuel costs—pushing the travel supply curve upward (the marginal cost curve)
- Later (i.e. post-Lehman), an autonomous decrease in consumption (increase in U.S. personal savings rates) exacerbated an earlier, more modest consumption contraction
- The associated drop in travel demand is coincidental to a simultaneous drop in marginal travel supply cost from falling oil prices/aviation fuel costs
- End result, lower travel pricing (air fares), permanent reduction in travel quantities (20 percent—equal to original lift reduction), with brief initial period of fare “overshooting” in summer 2008 as volumes began their decline (because of peaking oil prices).

# Undergraduate economics of 2008 travel demand

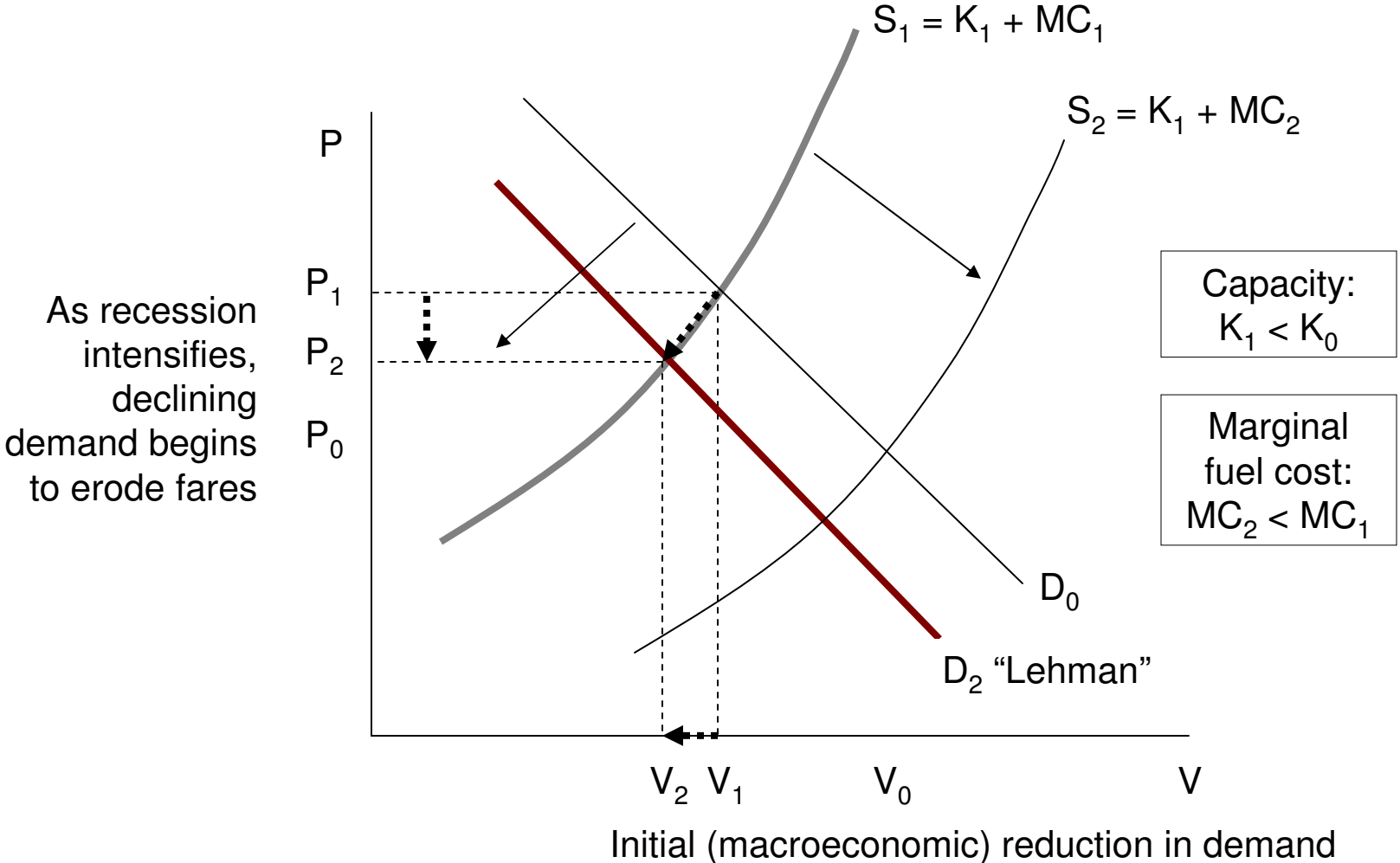


\*Technically, Hawaii tourist cost is a “two-part tariff:” you pay (air fare) to enter the amusement park, and you pay (hotel room rate) for each ride

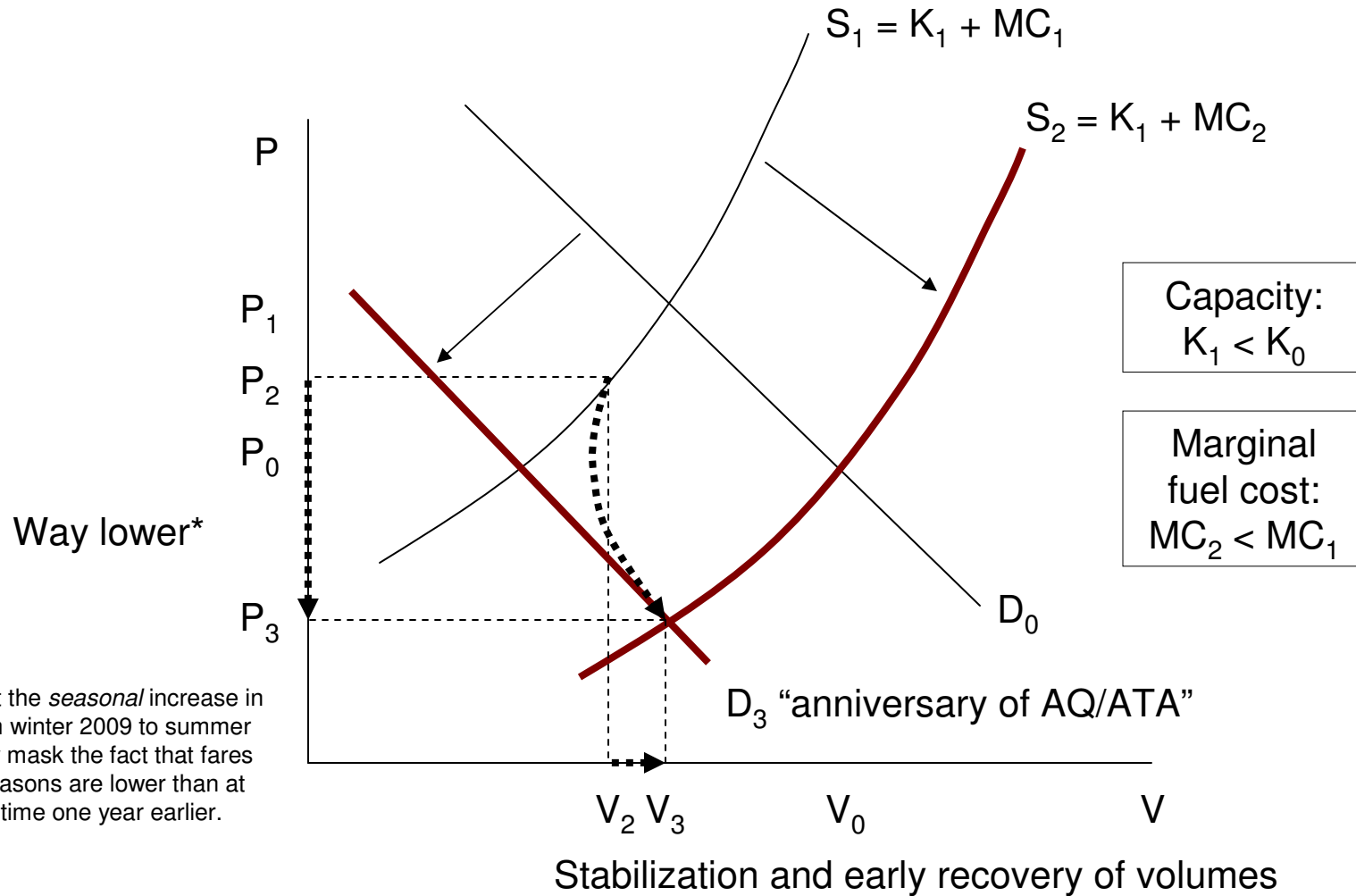
# Capacity reduction, higher oil prices, : decreased S



# Consumption drop (falling income, wealth): decreased D

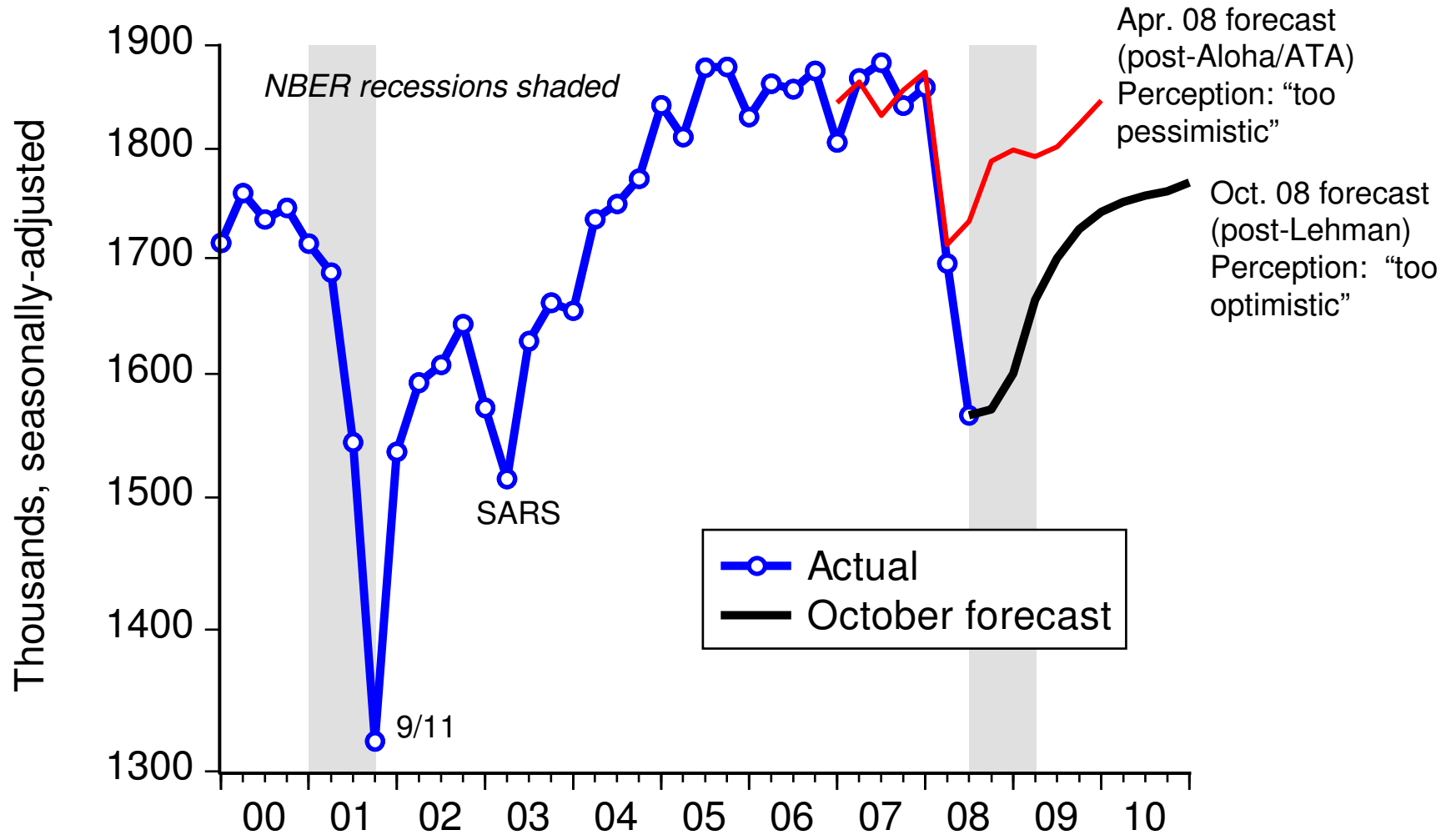


# Into 2009, full impacts: recession, oil price drop



\*Note that the *seasonal* increase in fares from winter 2009 to summer 2009 may mask the fact that fares in *both* seasons are lower than at the same time one year earlier.

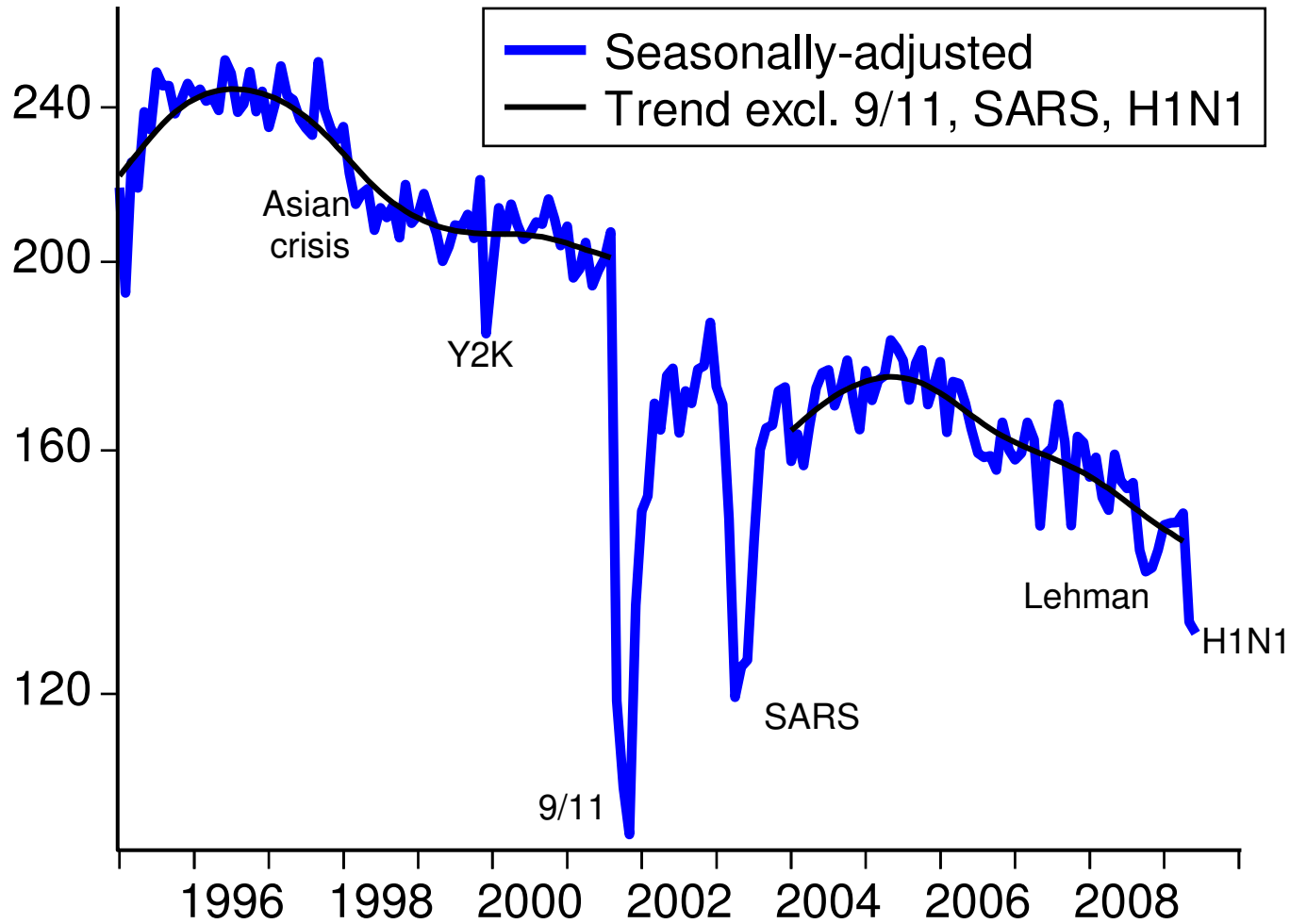
# Published Bank of Hawaii total arrivals forecasts



Slide copyright TZ Economics

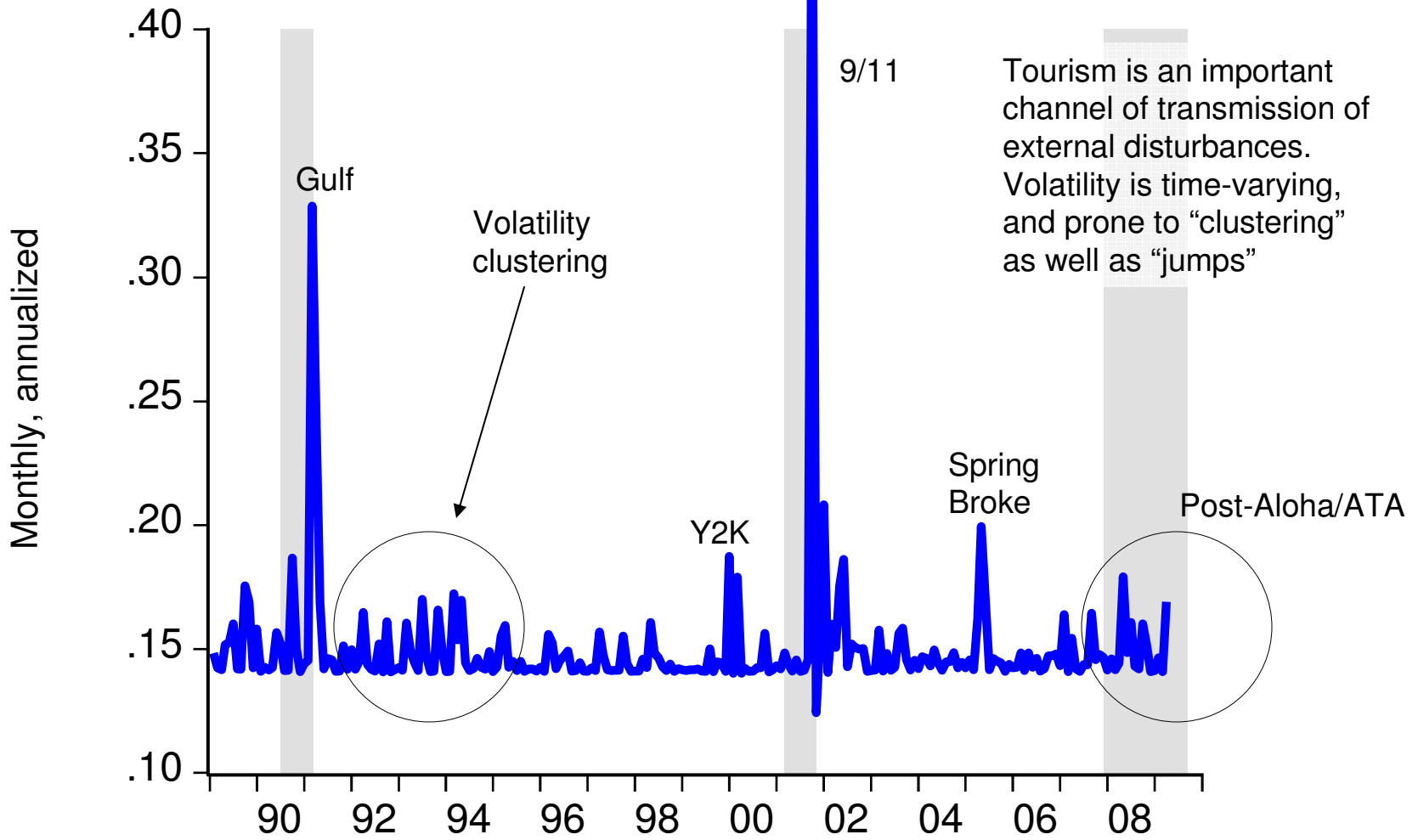
Source: Hawaii DBEDT; <https://www.boh.com/econ/reports/econ111708.pdf> and <https://www.boh.com/econ/reports/econ042008.pdf>

# International arrivals: no growth in a decade



# Conditional volatility:

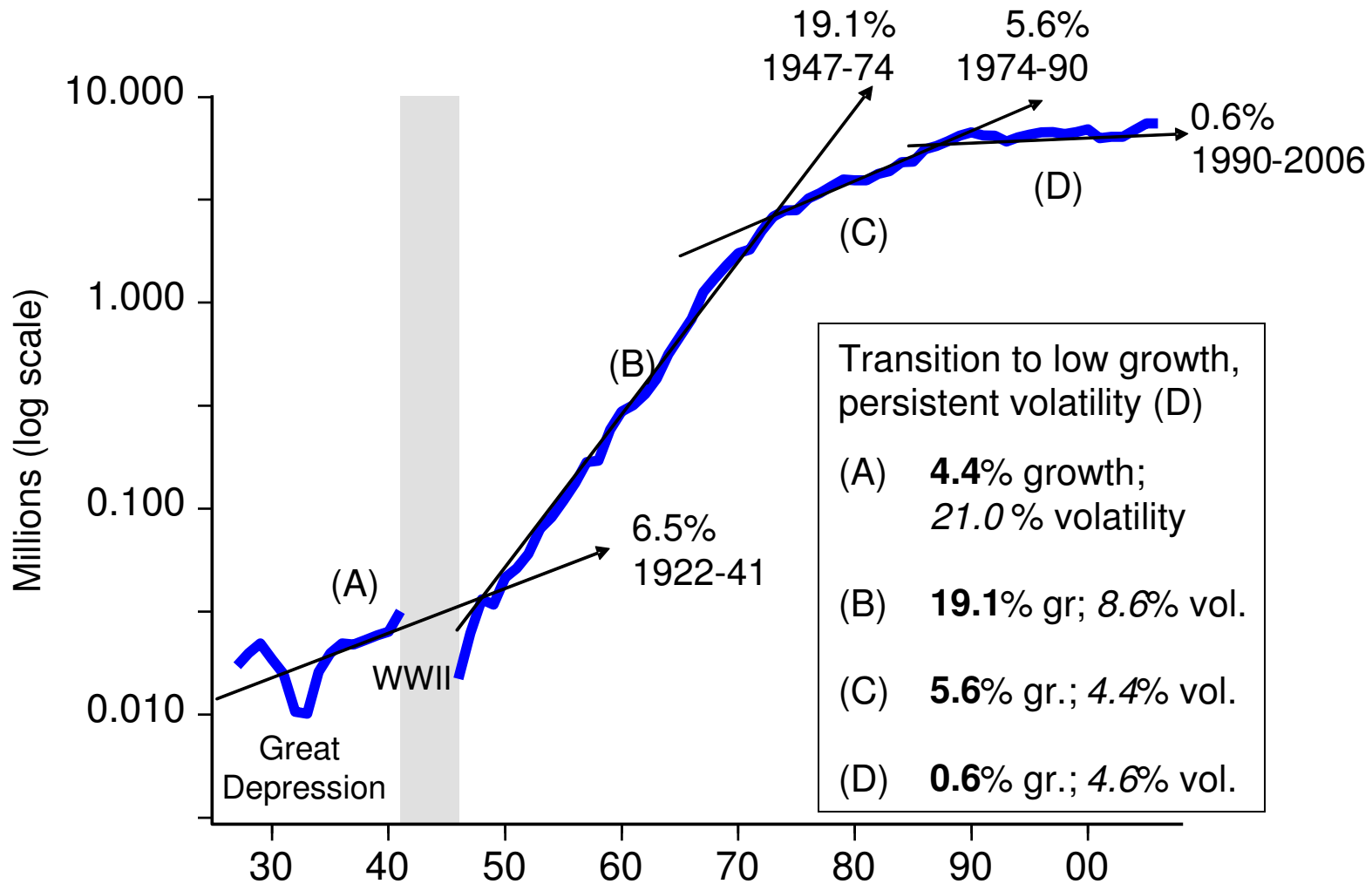
# Hawaii visitor arrivals



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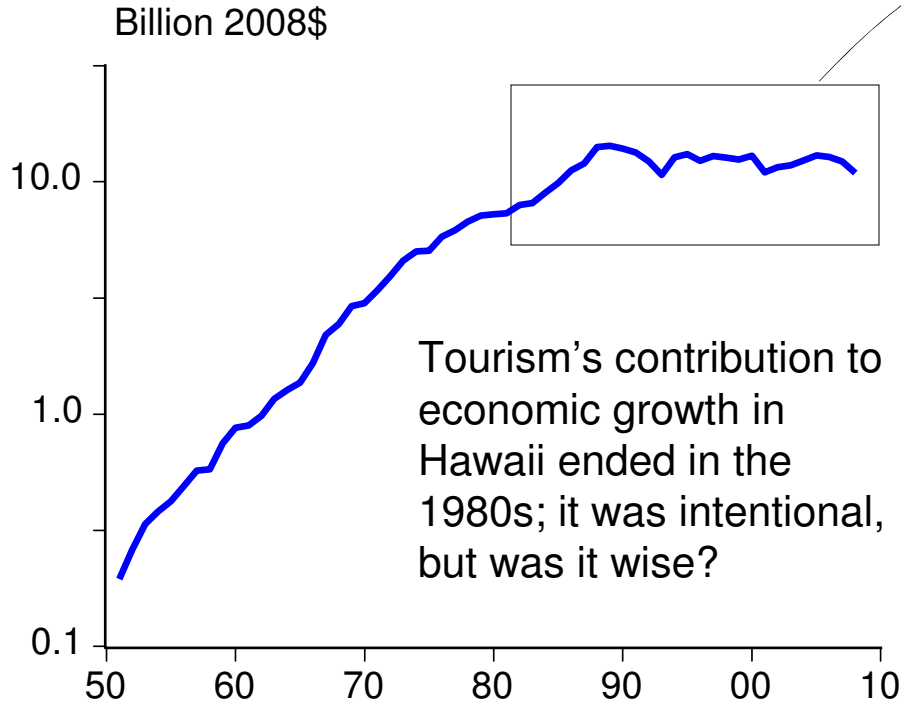
Source: Underlying data from Hawaii DBEDT; conditional annualized standard deviations in generalized autoregressive conditional heteroskedasticity model of the monthly log change of Hawaii visitor arrivals by TZ Economics

# Tourist arrivals once grew rapidly, now volatility dominates over growth trends

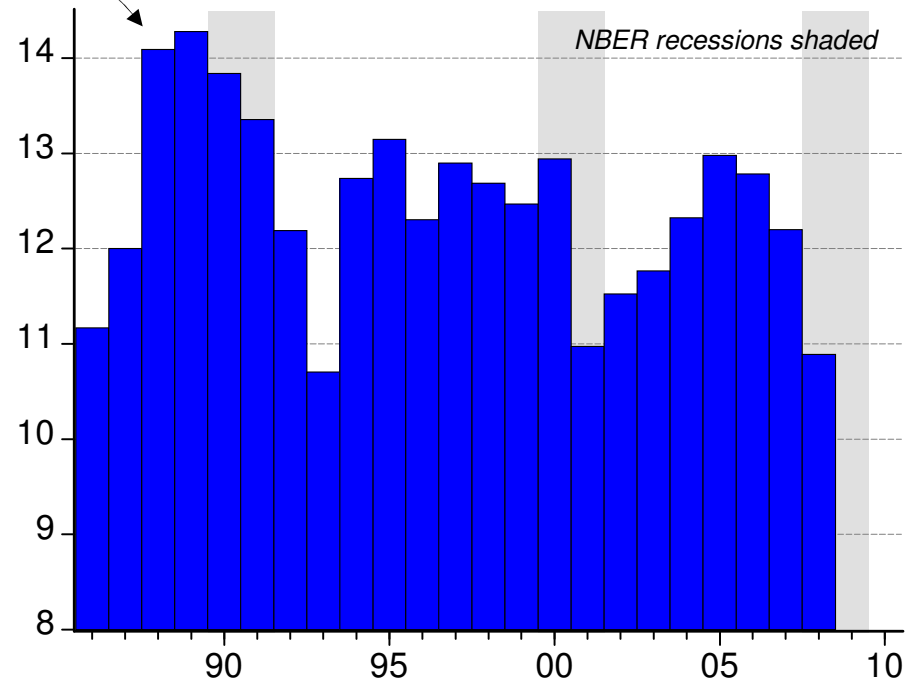


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# Tourism: high growth to no growth



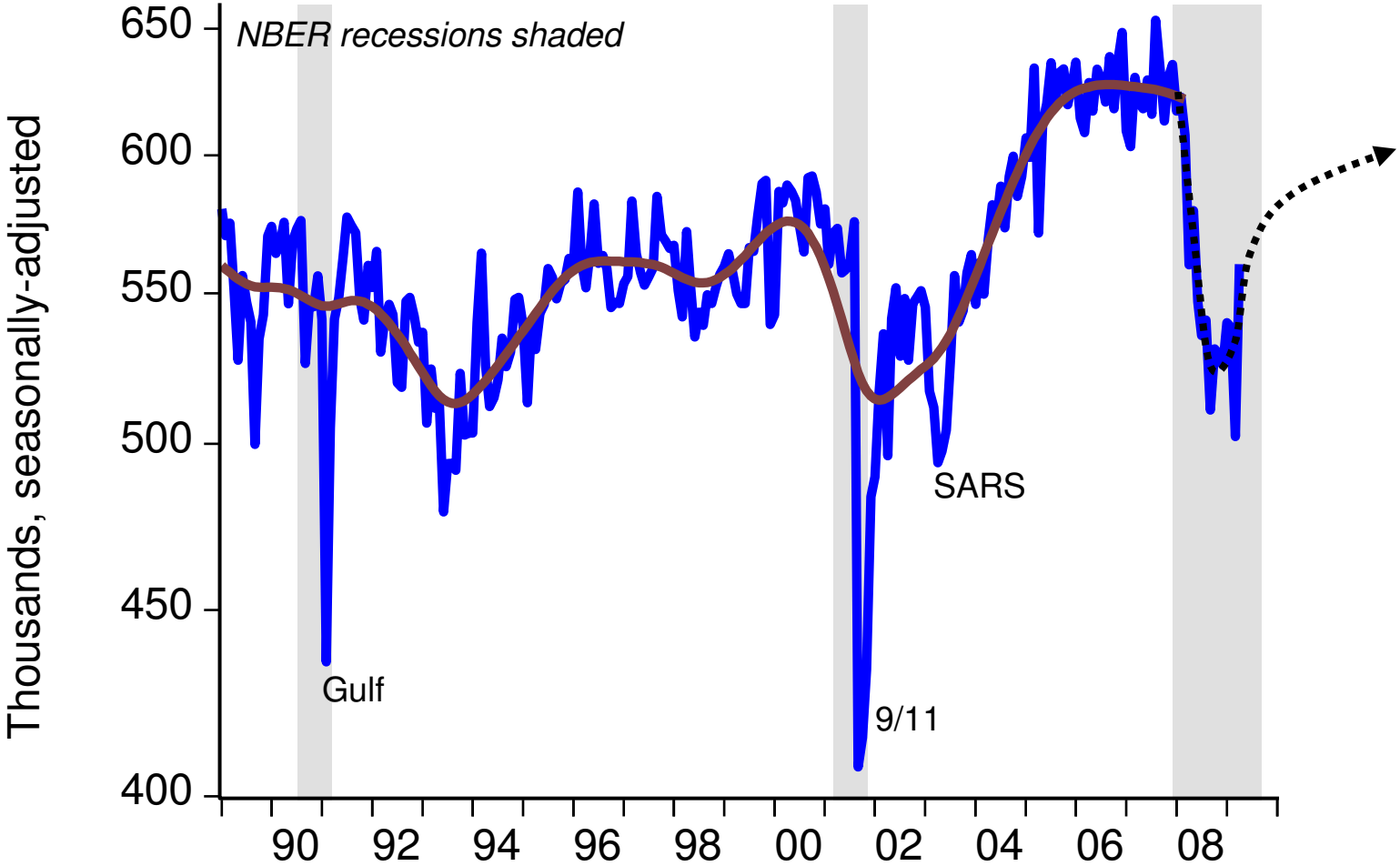
Real visitor expenditure  
1951-2008 (log scale)



1986-2008 (level scale)  
Dominant feature:  
volatility, not growth



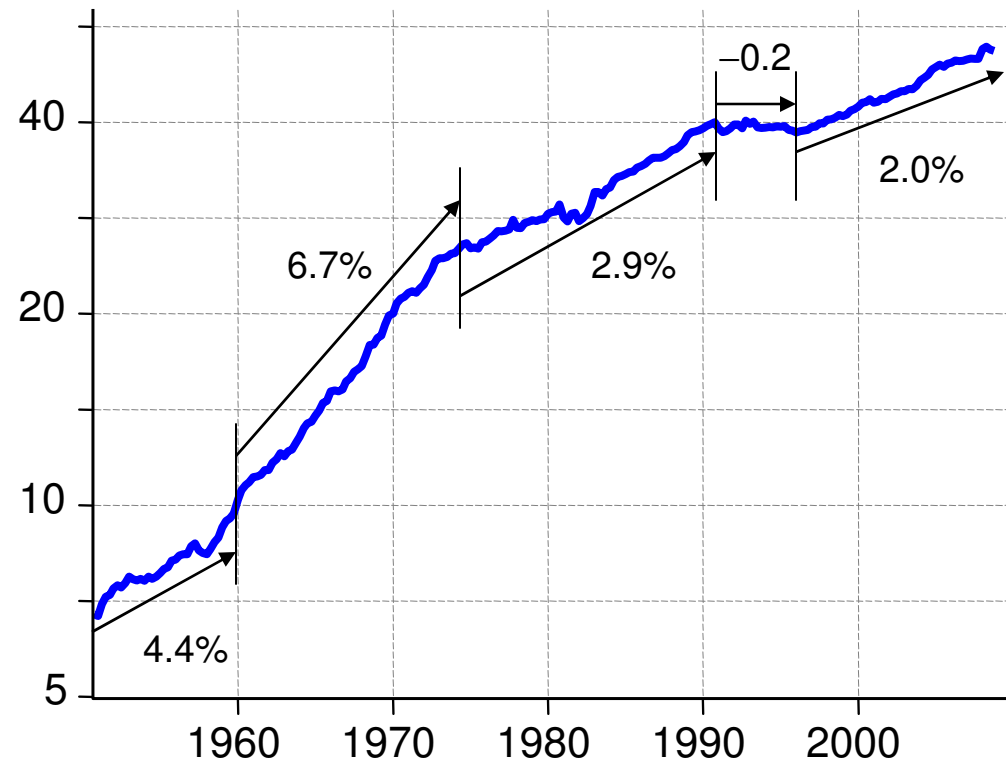
# Hawaii total visitor arrivals



# Labor force plus productivity = 2.8%

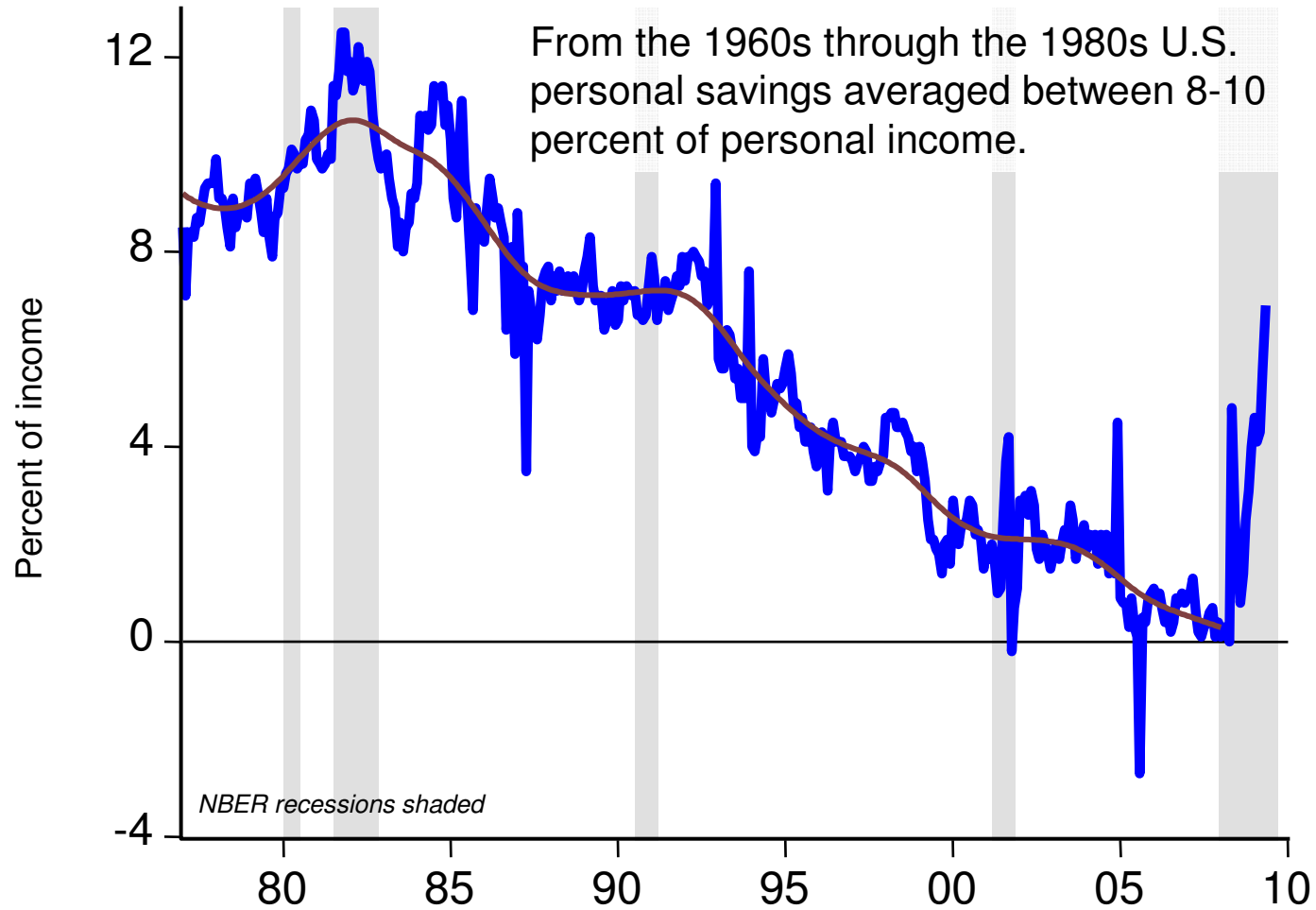
Hawaii real personal income (bil. 2008\$, log scale)

A combination of demographic factors and regulatory policies has limited real income growth below an upper bound around the U.S. potential real GDP growth rate\* given by the sum of labor force growth and productivity growth. Hawaii real income growth in the last decade has been less than that, and it is unclear if the political climate in Hawaii embraces a credible commitment to long-term growth in potential real income.



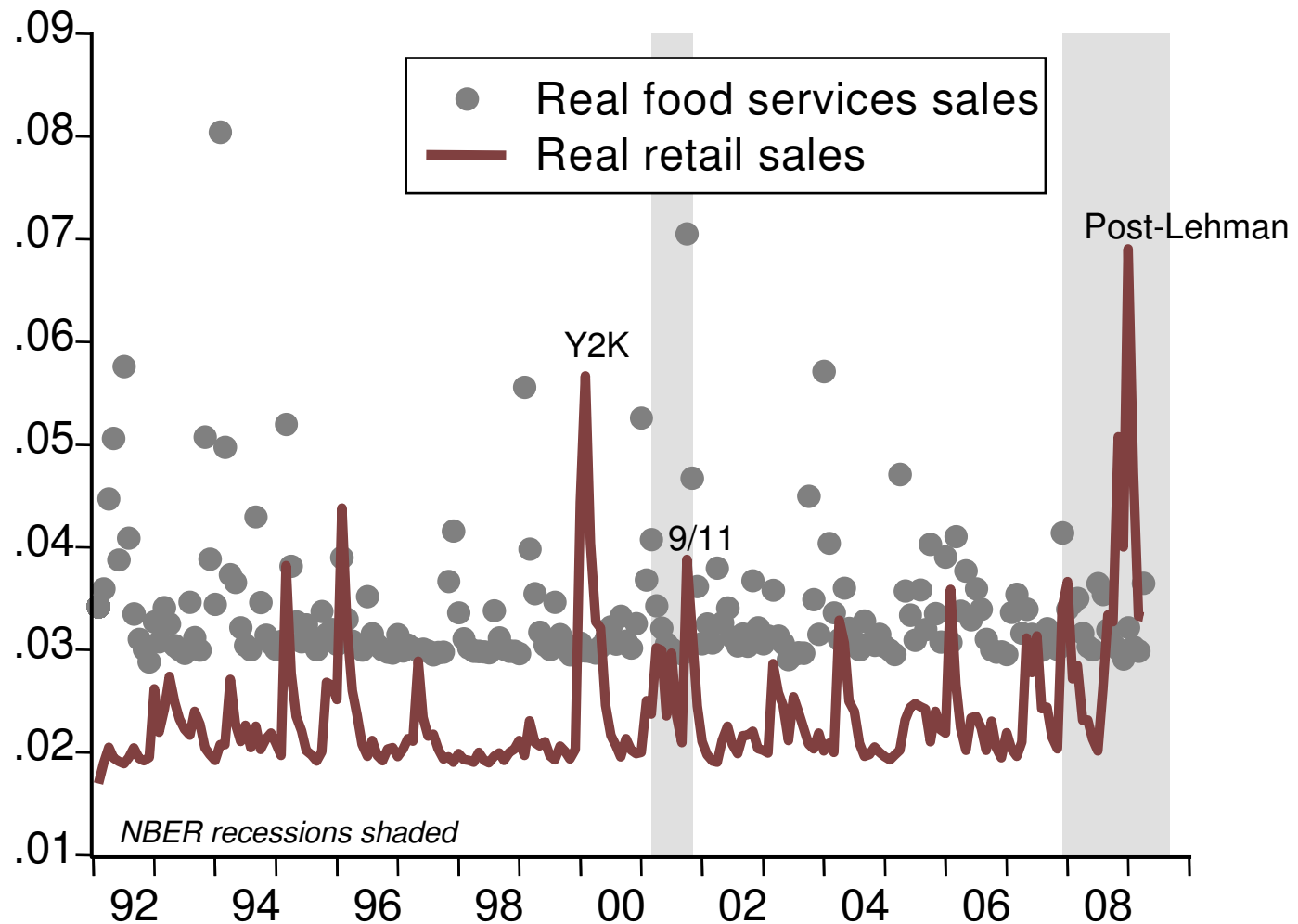
\*A steady-state growth rate at which inflation is not accelerating, consistent with full employment; numerical estimate from CBO

## Appendix 5: sudden personal savings shift



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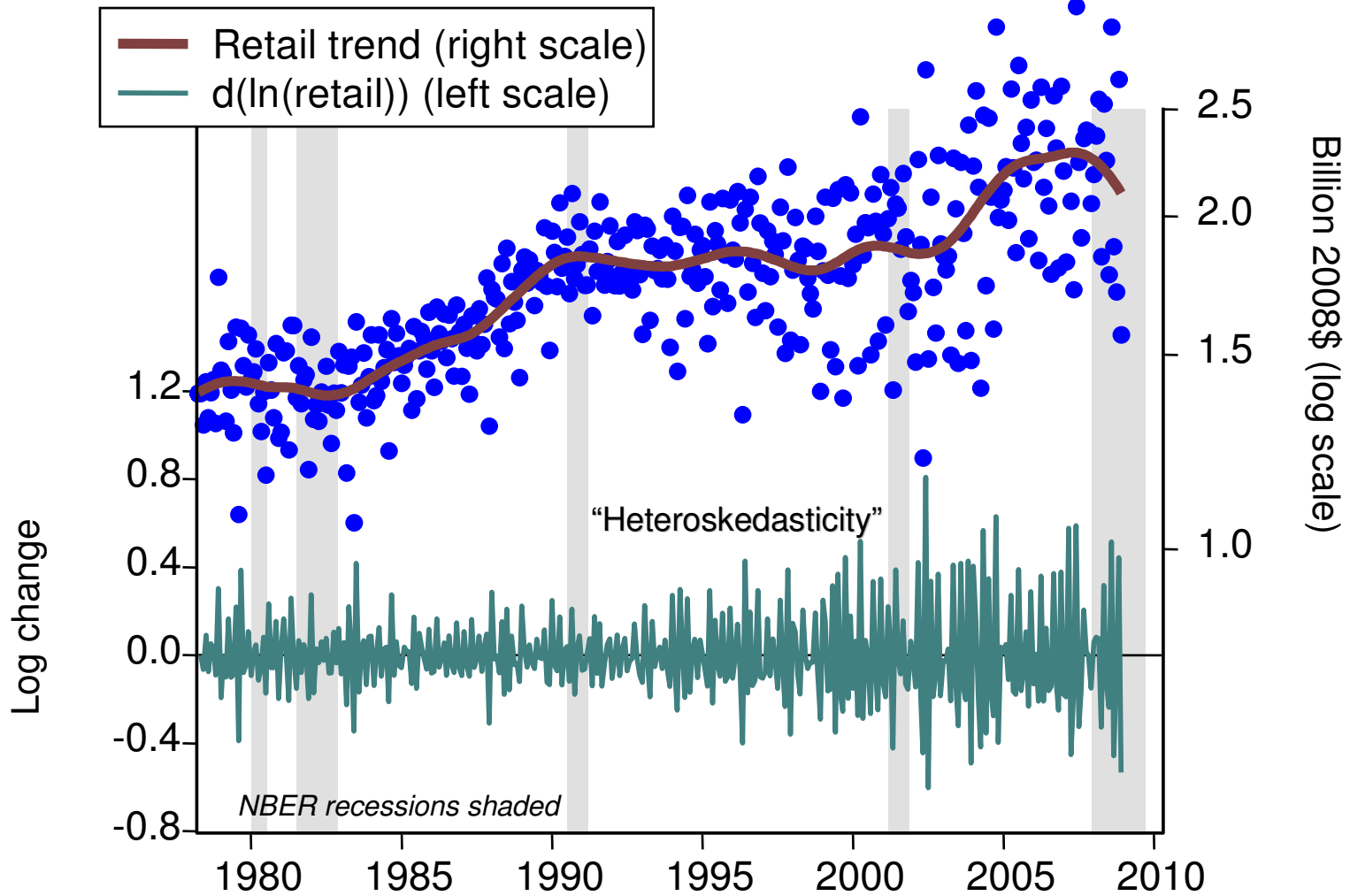
# Conditional volatility, retail and food services sales



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Source: Threshold autoregressive conditional heteroskedasticity annualized standard deviations by TZE

# Hawaii monthly real retail sales



Slide copyright TZ Economics

Source: Hawaii Department of Taxation; deflation with U.S. CPI-U and other calculations by TZE

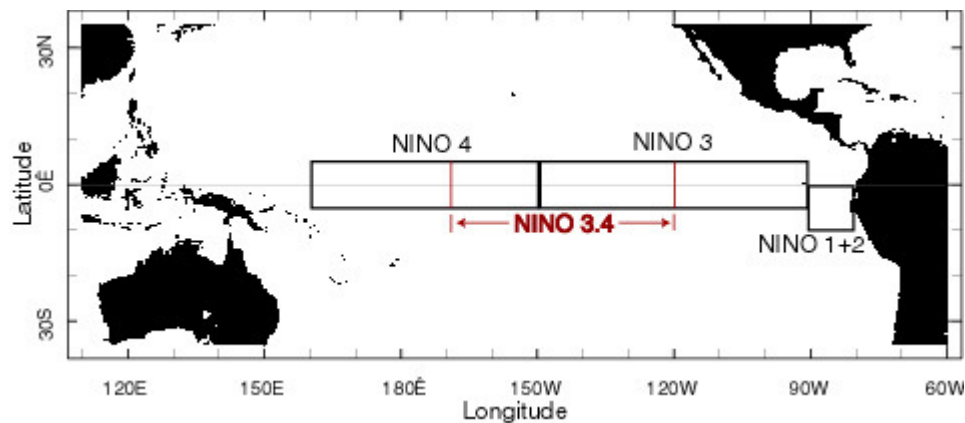
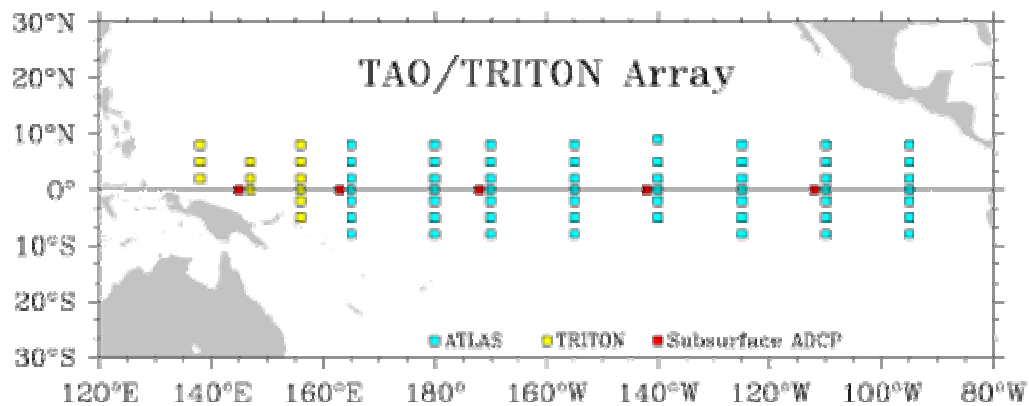


## Appendix 6: event risk is ubiquitous

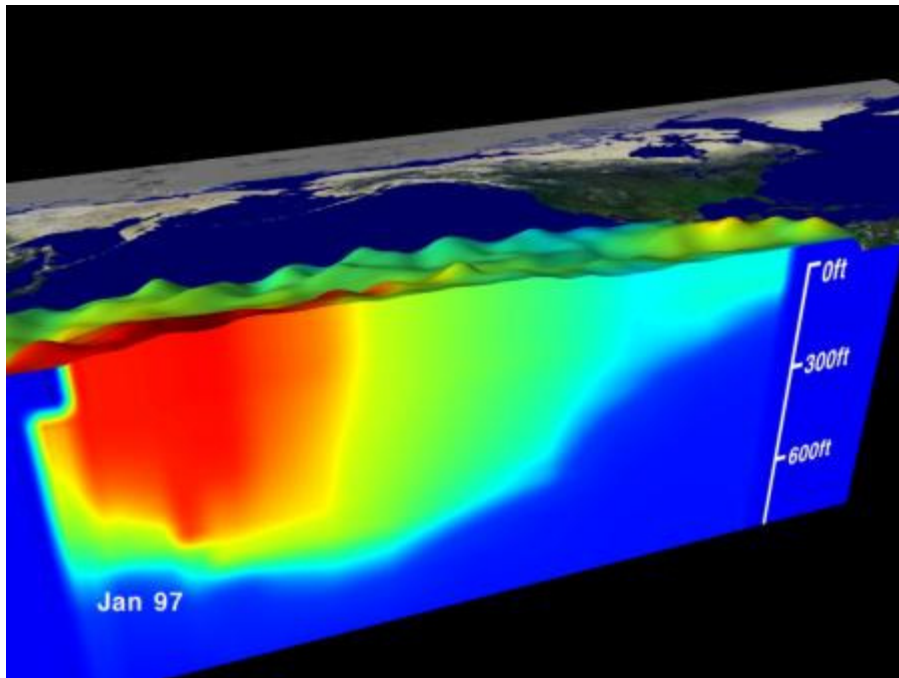
- In a slow growth/no growth economy, volatility dominates
- Some risk is of a white noise variety, “Brownian motion”
- Some risk shows up as “Black Swans,” improbable high-loss events that seem unlikely *ex ante* but plausible *ex post*
- Technically, these “Poisson shocks” have stochastic arrival times, but you know eventually they *will* happen



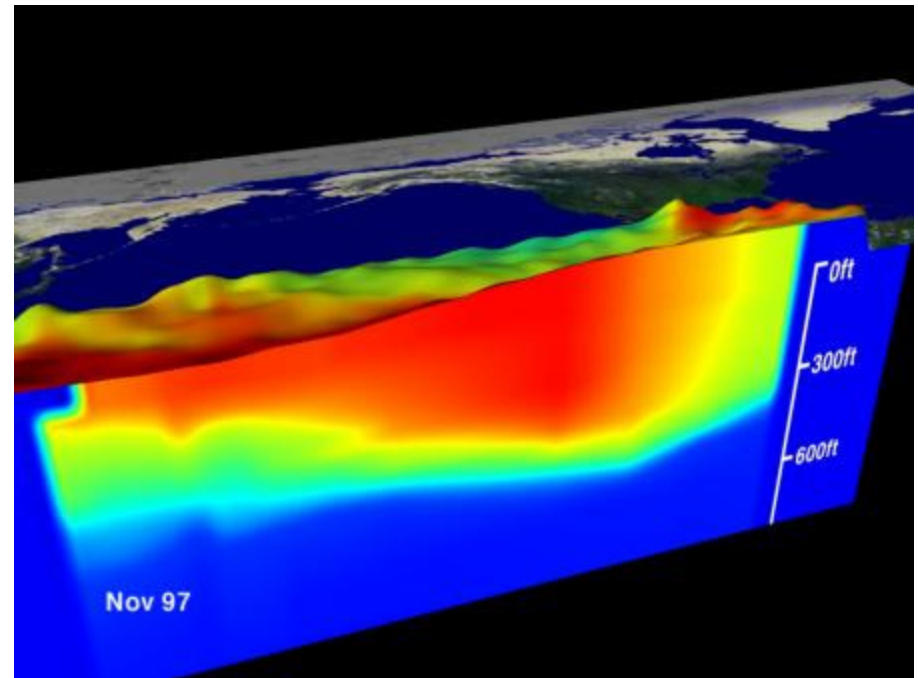
# Data-gathering buoys



# Normal and El Nino temperatures



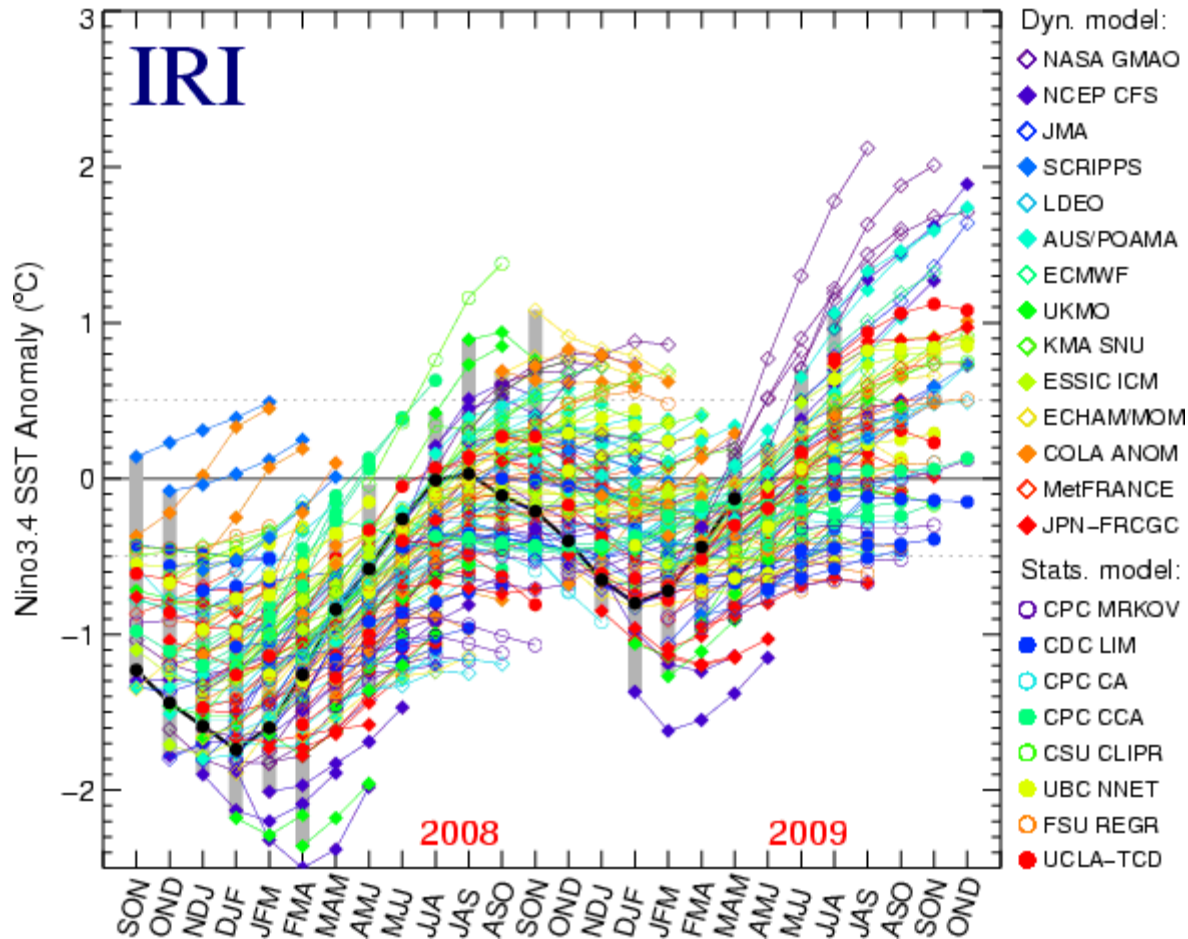
Normal (red is hot)



El Nino (red is hot)

# Forecasts for Sea Surface Temperature (SST) anomaly from 120°-170°W ±5°N-S

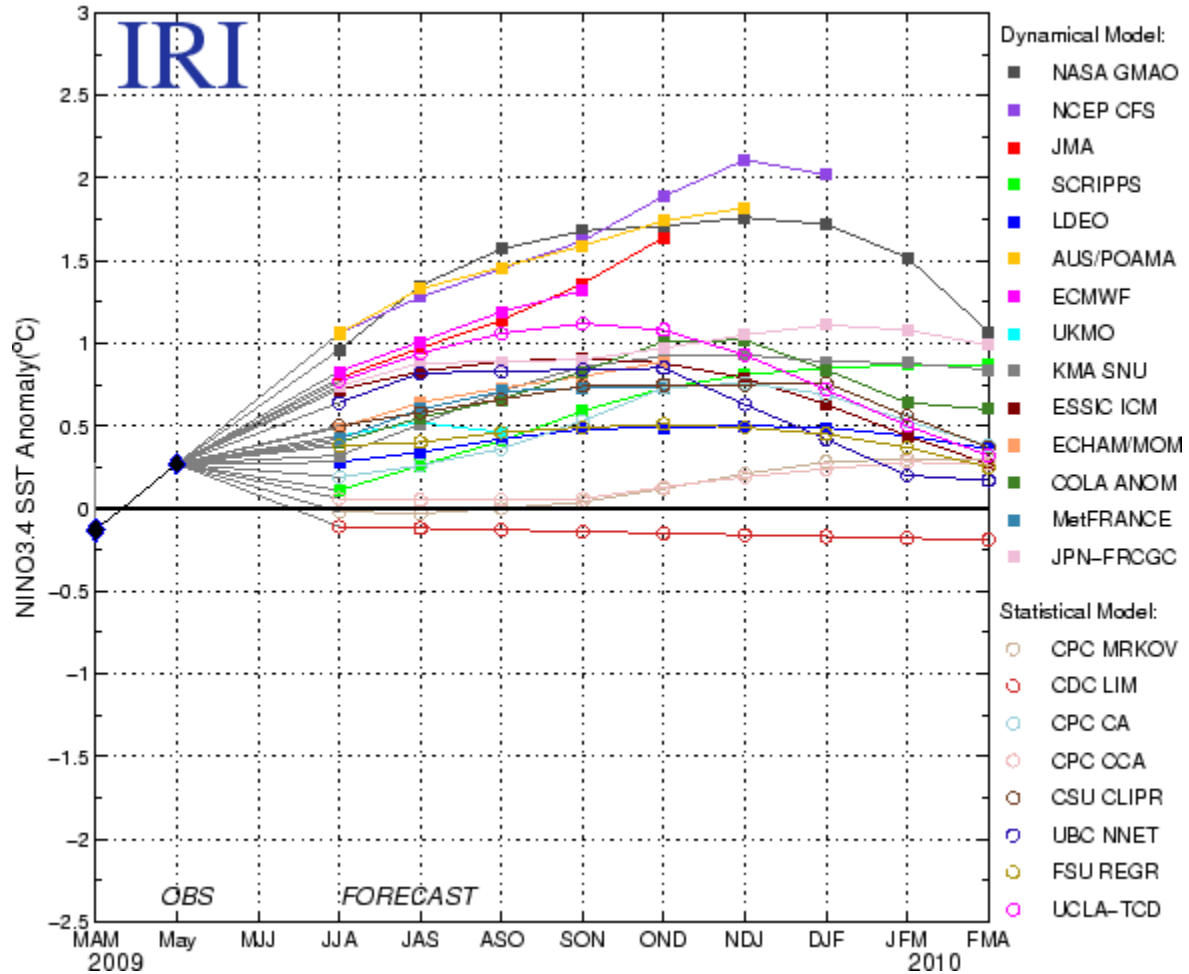
ENSO Forecast from Sep 07 to Jun 2009



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# Forecasts for Sea Surface Temperature (SST) anomaly from 120°-170°W ±5°N-S from June 2009

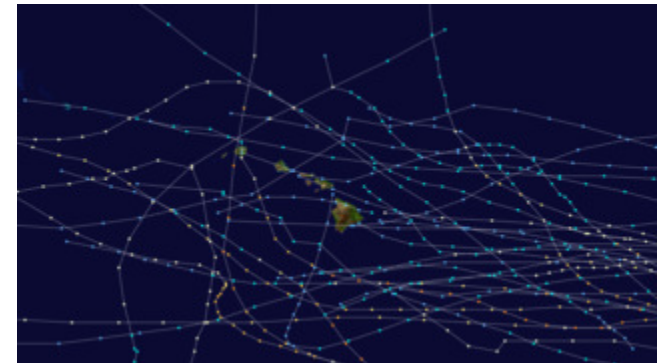
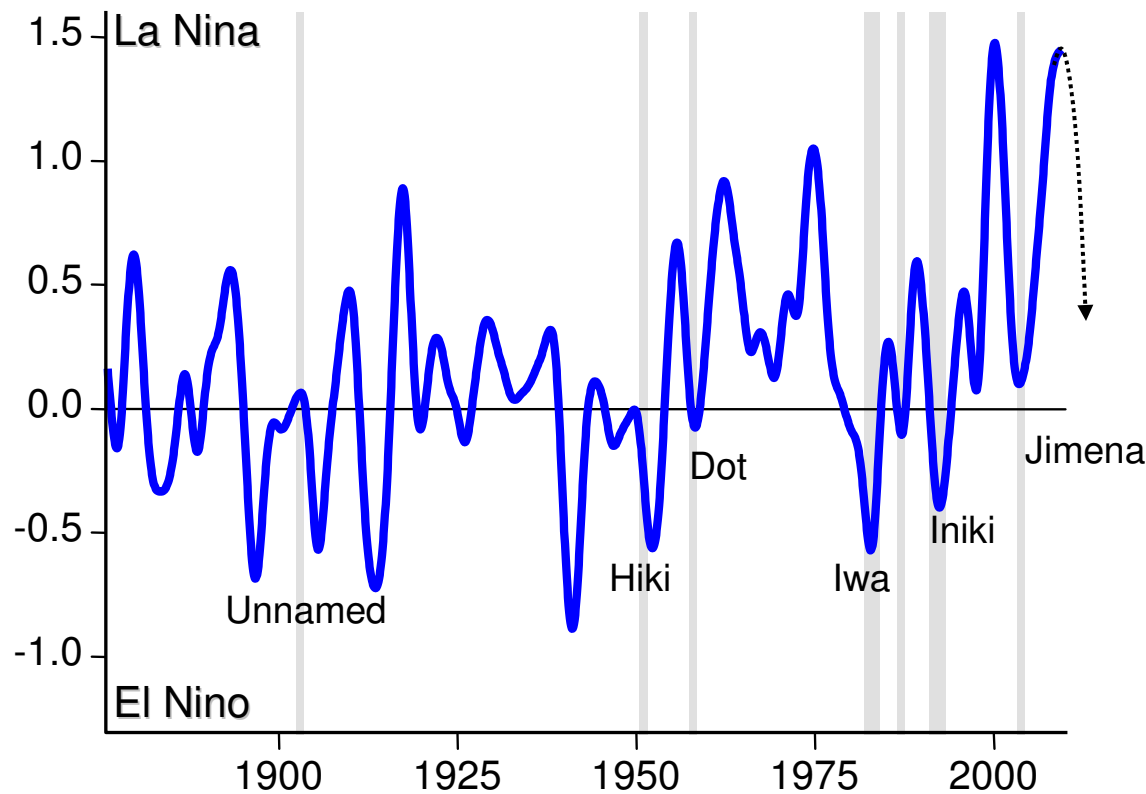
Model Forecasts of ENSO from Jun 2009



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# Standardized Southern Oscillation Index (SOI): Hodrick-Prescott filter (1997) trend

Benchmarked to 1880-1990 period (roughly)



Name	Year	Number of deaths
Iniki	1992	6
Estelle	1986	2
Uleki	1988	2
Hiki	1950	1
Iwa	1982	1
Eugene	1993	1 <i>missing</i>

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Sources: Wikipedia, NOAA, <http://www.cpc.ncep.noaa.gov/data/indices/soi>; Hodrick-Prescott filter application by TZE using original recommended monthly tuning parameters