

Fisheries and Farming: Interdependence of Fisheries, Animal Production and Aquaculture

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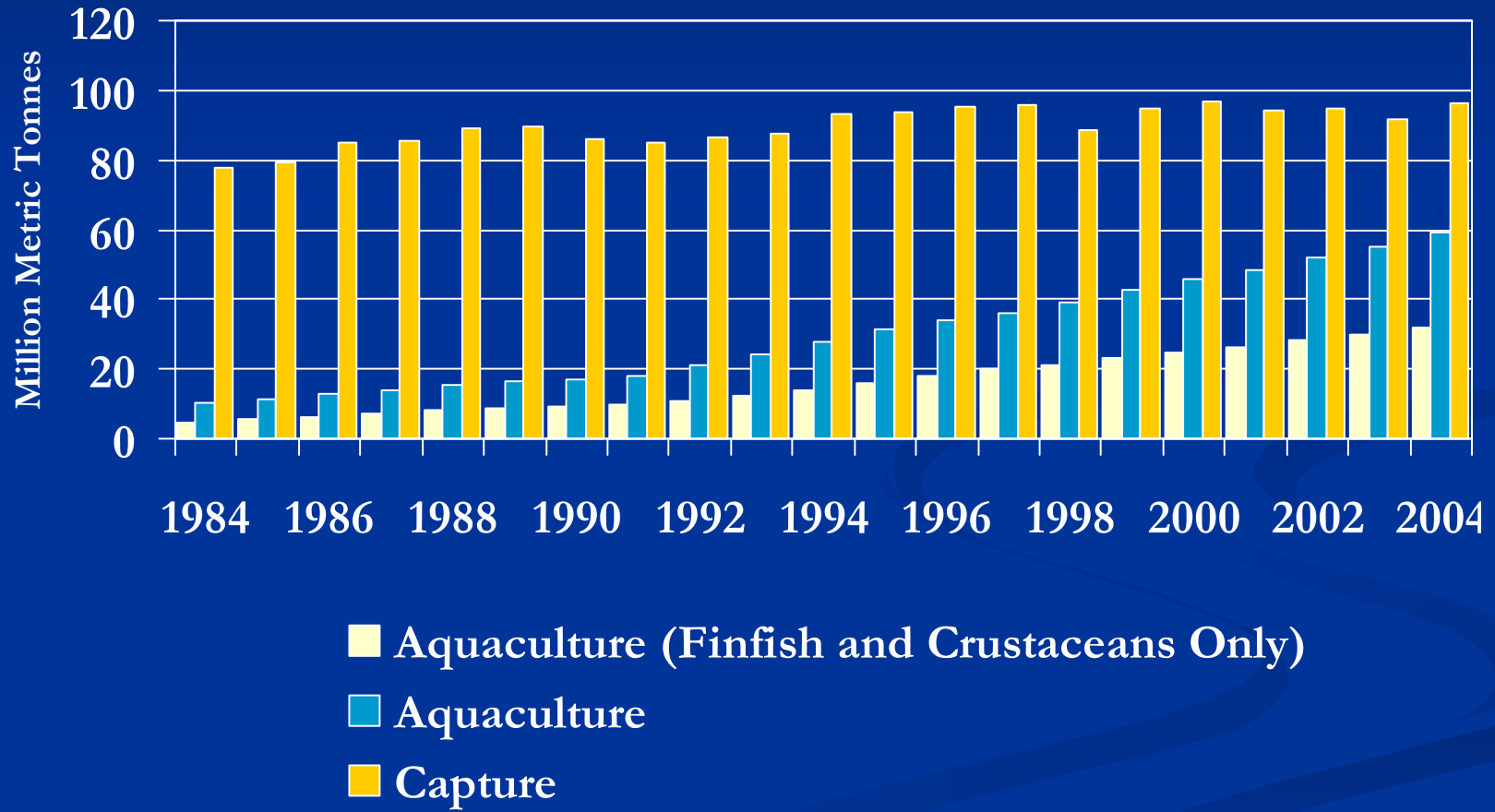
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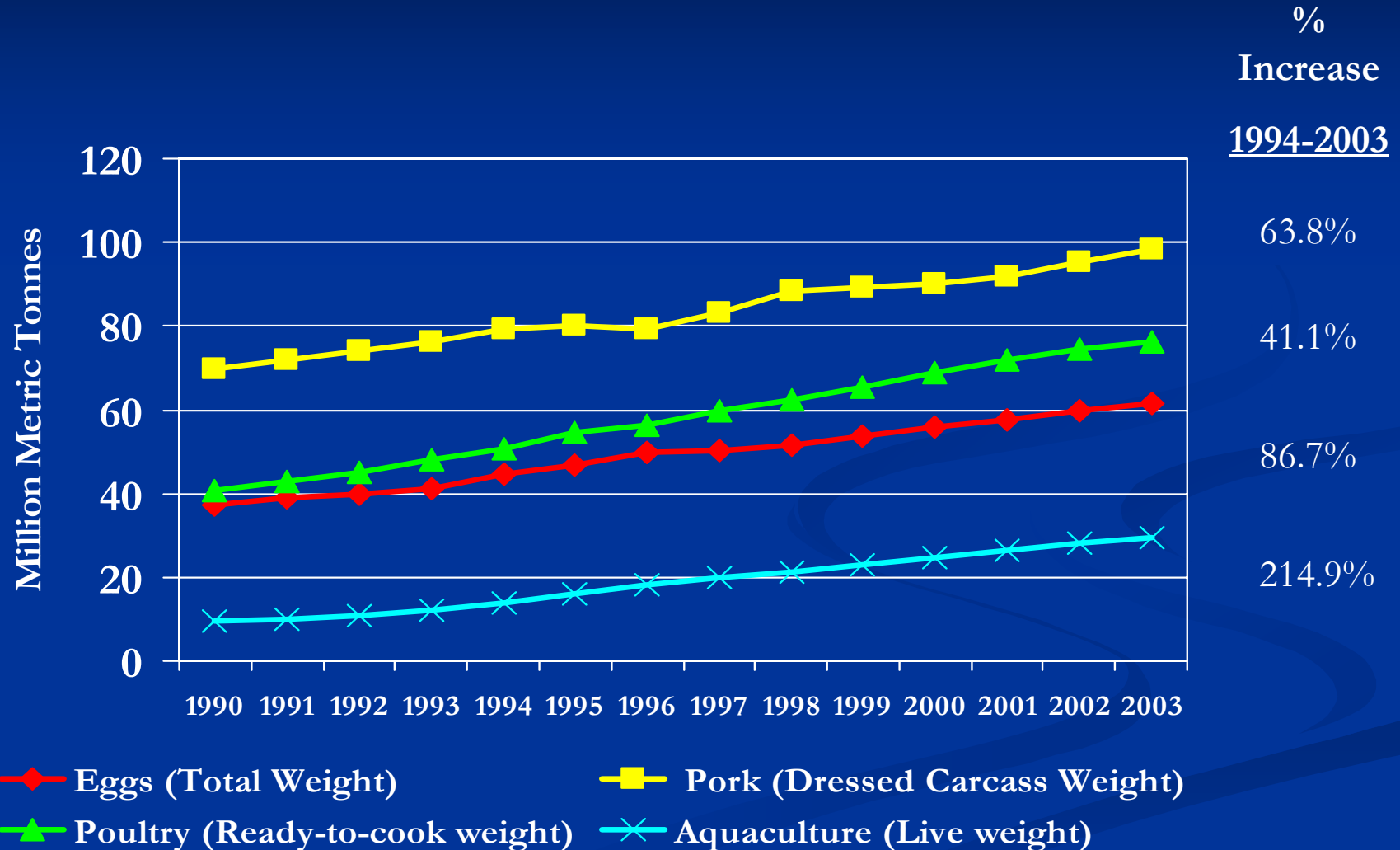
Introduction

- Fishmeal is a critical feed component for:
 - Poultry
 - Pork
 - Aquaculture (Salmon, trout and shrimp)
- Relatively fixed supply vs. increasing demand
- Issues regarding substitutability across protein sources

Trends in Global Aquaculture Production

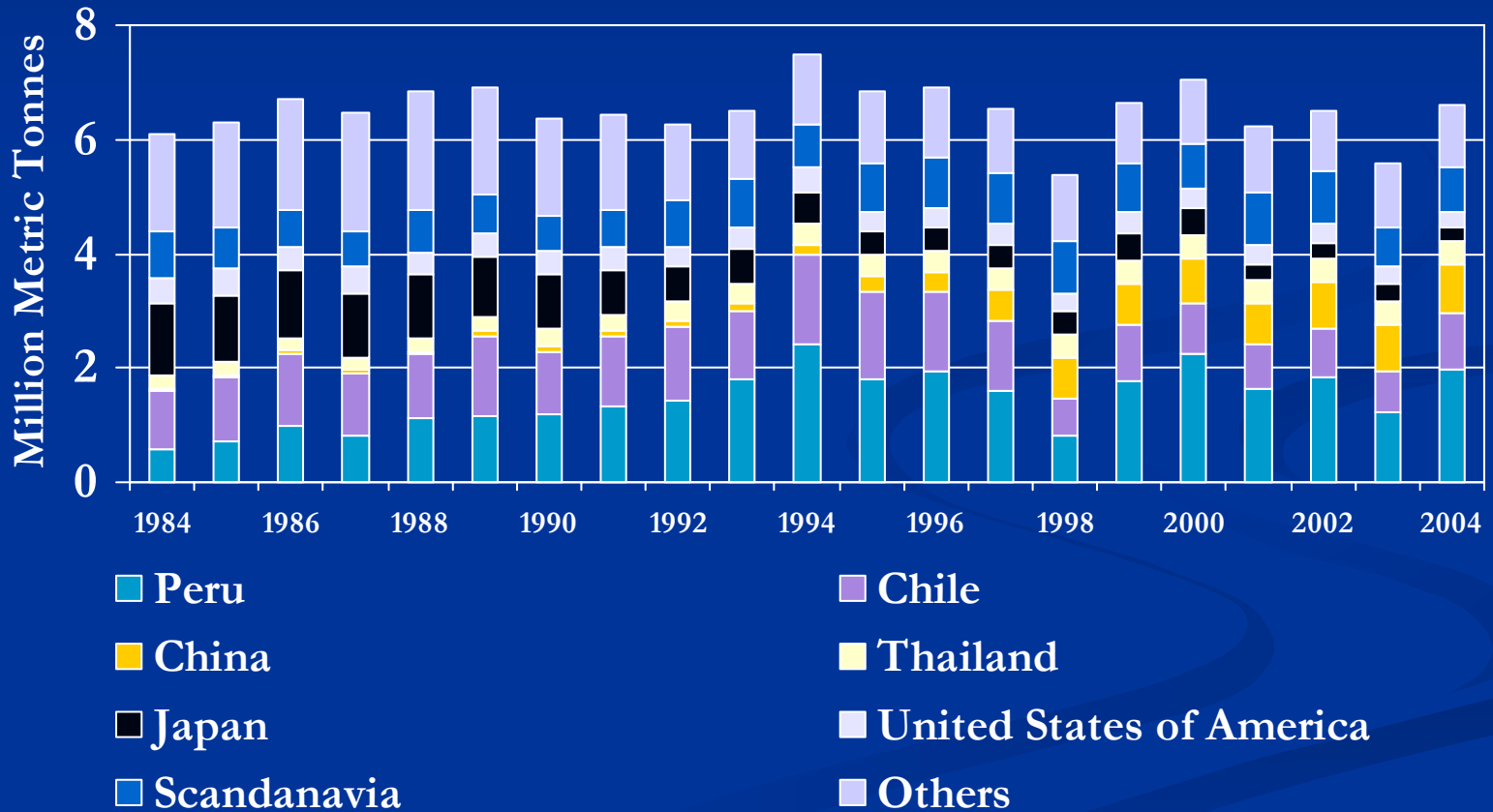


Trends in Global Animal Production



Trends in Global Fishmeal Production

Average Production (1984-2004): 6.5 MMT



Fishmeal Production

- Peru is the major supplier of both fish meal and fish oil.
- In Peru the major species harvested are anchovy (*Engraulis ringens*) and jack mackerel (*Trachurus symmetricus*)
- Both species are small in size, have a short life span, and are highly influenced by El Niño events.

El Niño Events

- Calculating El Niño /La Niña Events:
 - Measured as the departure in monthly sea surface temperature from its long-term mean averaged over the NINO 3.4 region.
 - El Niño and La Niña typically develop between April and June
(Spring in the Northern Hemisphere /Autumn in the Southern Hemisphere)
 - The duration of El Niño and La Niña events can vary substantially from event to event

El Niño Events

■ Strong El Niño Events

- 1982-83
- 1987-88
- 1993-94
- 1994-95
- 1997-98

■ Mild El Niño Events

- 1991-92
- 1992-93
- 2002-03
- 2004-05

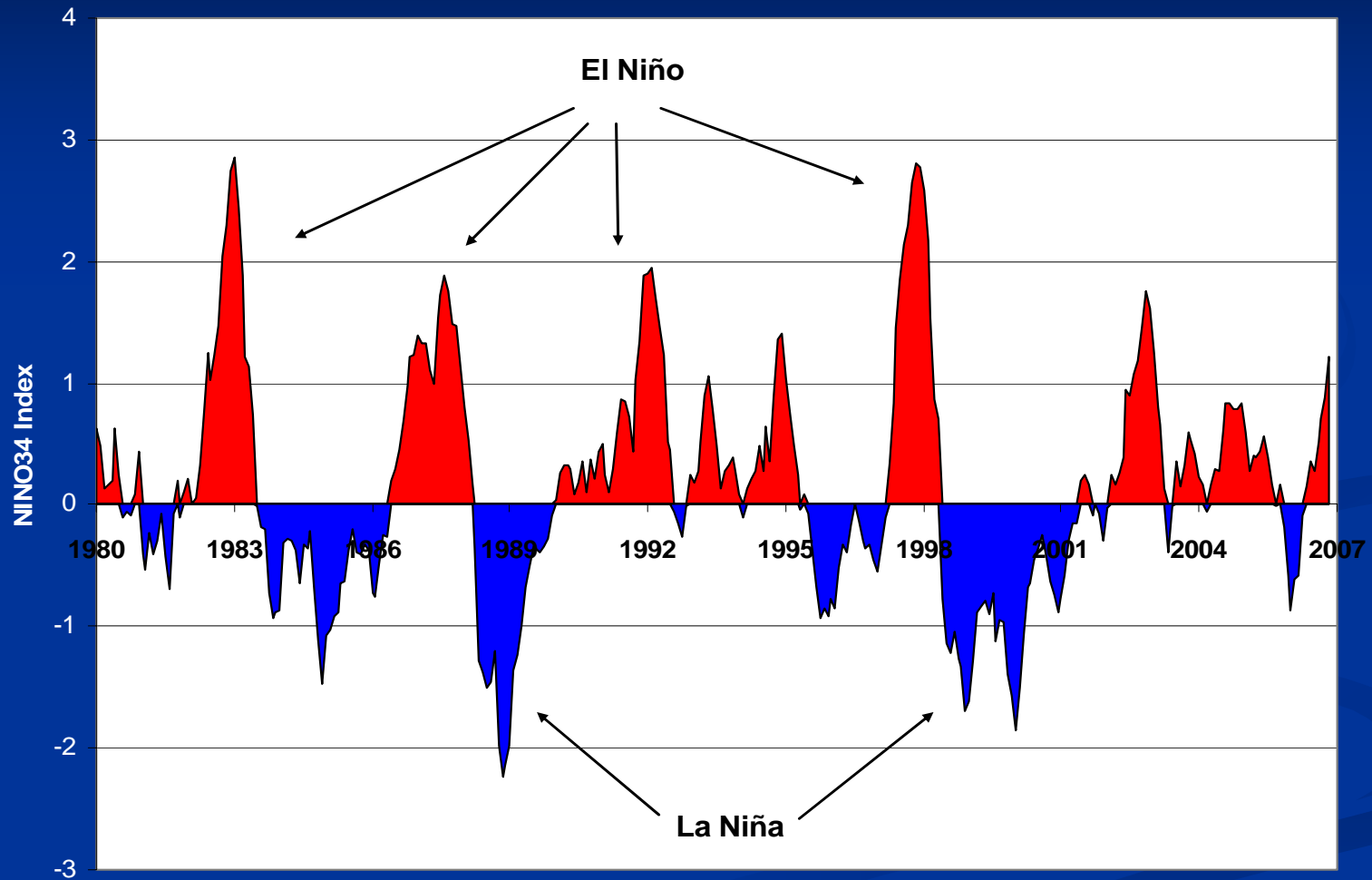
■ Strong La Niña Events

- 1988-89
- 1998-99

■ Mild La Niña Events

- 2000-01

El Niño Events



Source: NOAA--National Weather Service--Climate Prediction Center
<http://www.cpc.ncep.noaa.gov/data/indices/sstoi.indices>

Has the price relationship changed?

- Given the rapid growth in poultry, pork and aquaculture sectors---
- Has the historic relationship between fishmeal and soybean meal prices broken down?

Issues of Substitutability

The critical question is:

Does fishmeal have unique nutritional properties that distinguish it from the general oilseed market?

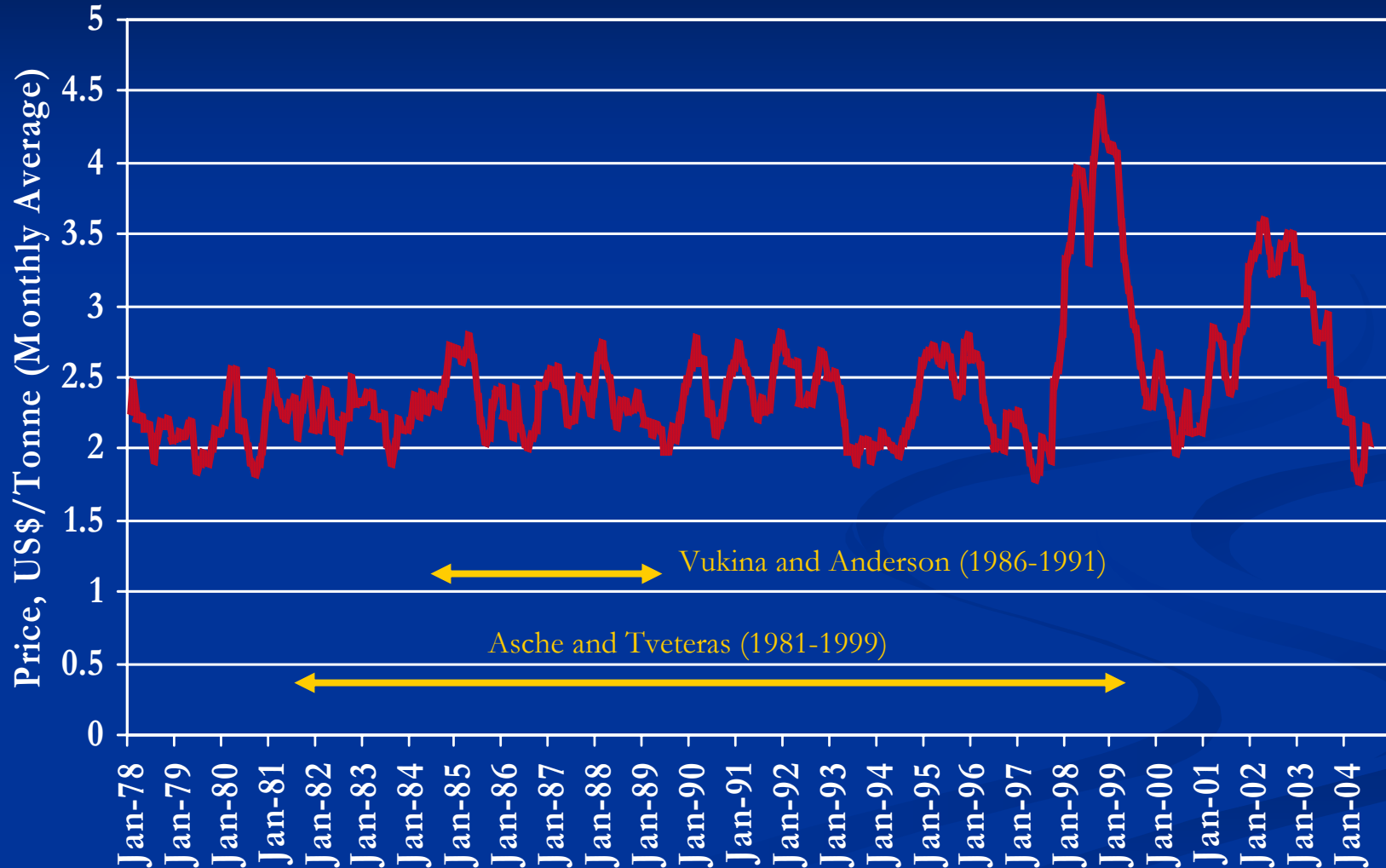
Prices of Fishmeal (Atlanta) and Soybean Meal (Chicago)



Has the price relationship changed?

- Vukina & Anderson (1993) (Data 1986-1991, weekly)
 - Cross-commodity hedging with soybean meal.
- Asche & Tveteras (2004) (Data 1981-1999, monthly)
 - Fishmeal and soybean meal are strong substitutes.

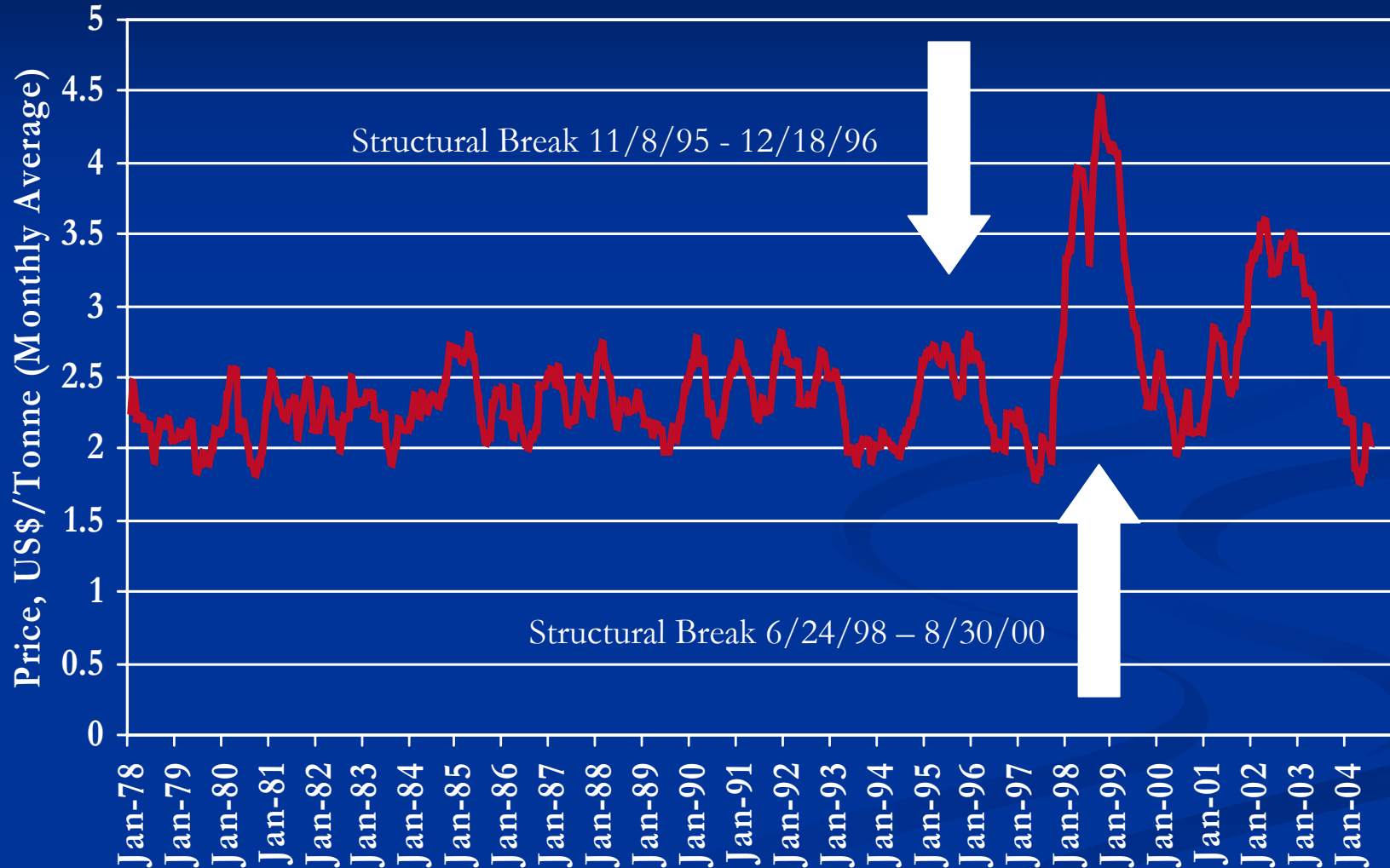
Price Ratio of Fishmeal (Atlanta) to Soybean Meal (Chicago)



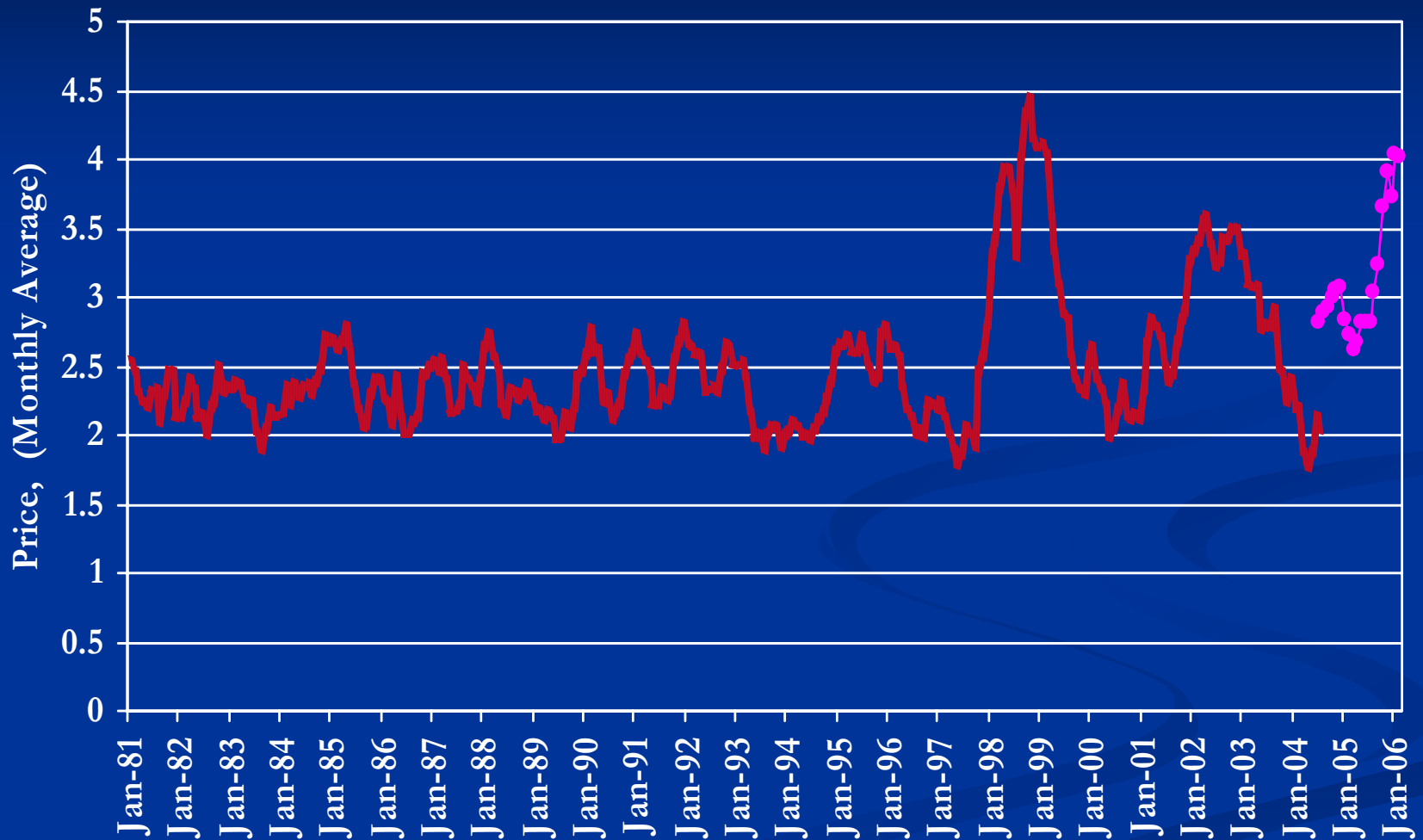
Findings

- Kristofersson and Anderson (2006) identify two structural breaks (1996, 1998). Used Bai-Perron test for structural change
- It appears the historic price relationship has broken down.

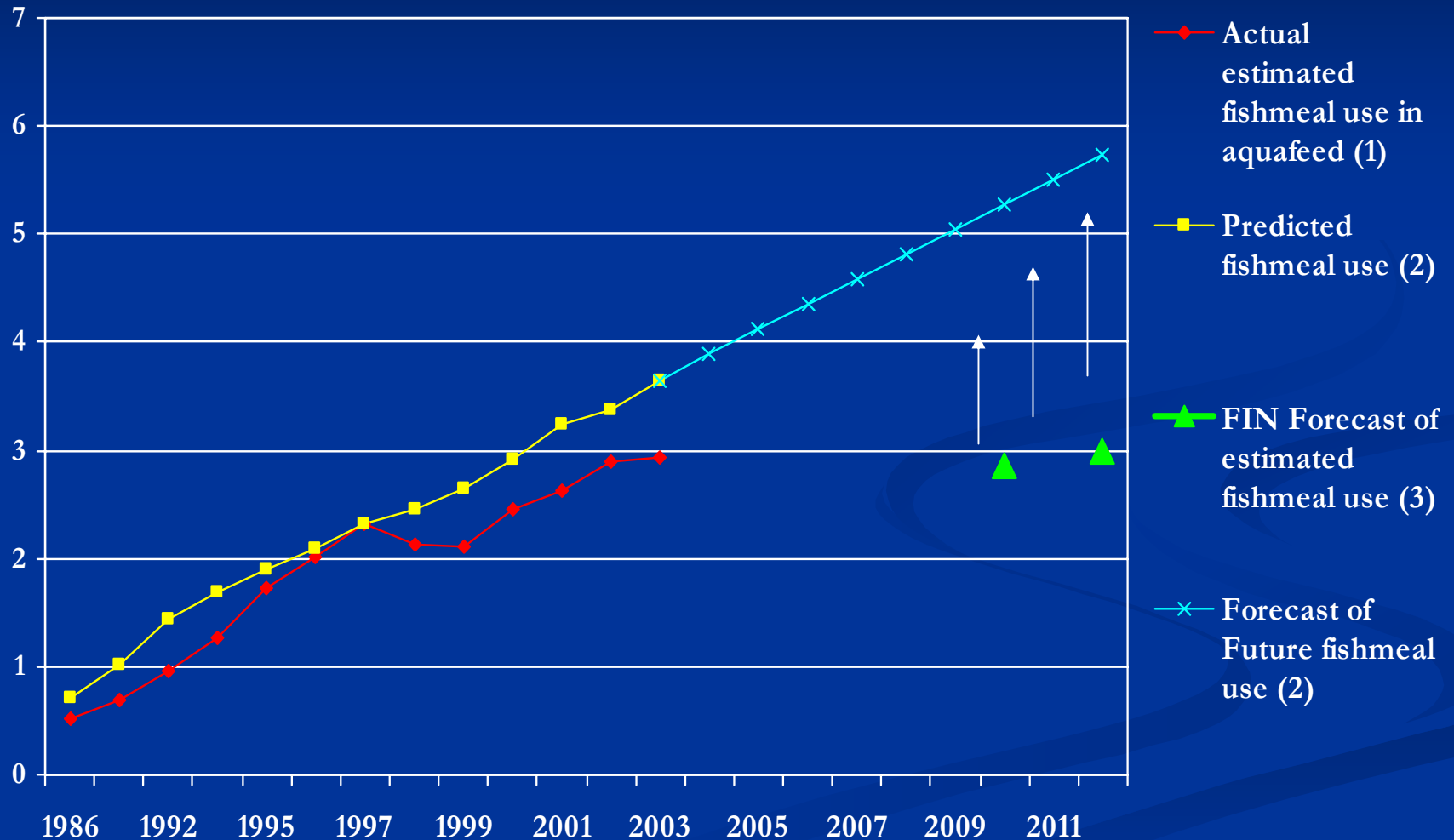
Price Ratio of Fishmeal (Atlanta) to Soybean Meal (Chicago)



Price Ratio of Fishmeal (Atlanta) to Soybean Meal (Chicago) with additional Fishmeal (Hamburg) and Soybean Meal (Rotterdam/Hamburg) data (July 2004 – February 2006)



Predicted fishmeal use vs. Estimated actual fishmeal use



Sources: (1) Various Sources (2) Based on 1997 fishmeal/aquaculture production ratio (Naylor et al. 2000) (3) 2010, Pike and Barlow (2002); 2012, Pike (2005)

Explanations for divergence

- Change in Species Mix? NO
 - The share of carnivores raised has not changed. Has remained 18.8-24.8% over past 20 years.
- Change in FCR? YES
 - FCRs have declined for salmon from over 2.0 to 1.3 over the past 20 years
- Better use of fishmeal, better farm management practices? YES

Conclusions

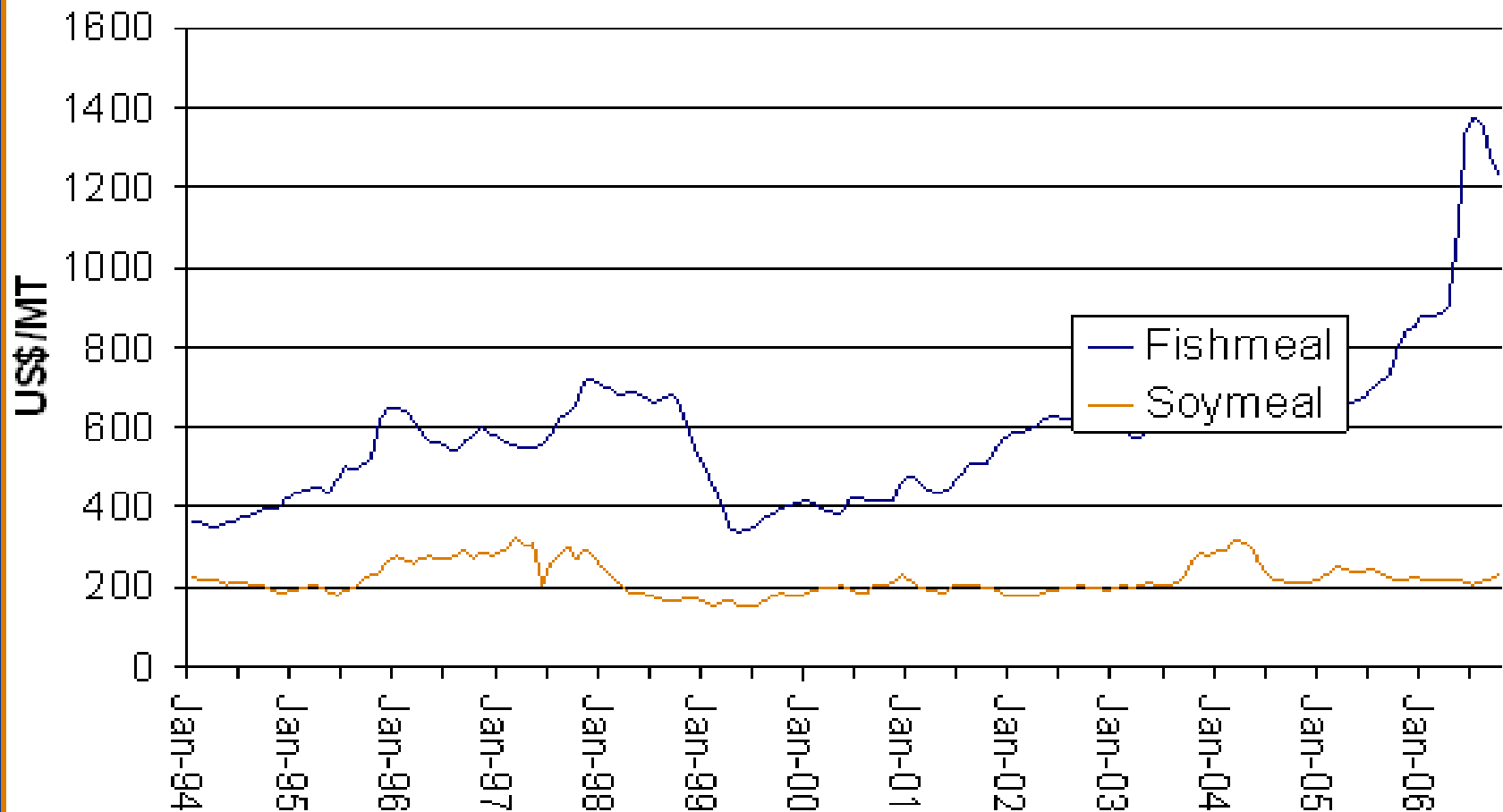
- Empirical evidence supports hypothesis of a structural change.
- This is due to increased demand for fishmeal from poultry, pork, and aquaculture in specialty diets.
- Provides economic incentive for innovation.
- Evidence of such innovations include
 - Declining FCR, new feed formulations, better farm management practices.

Recent Industry Developments

- Fishmeal prices skyrocketed in May 2006 to almost \$1400/tonne. (USD)
- Soymeal prices are relatively stable around \$210/tonne (USD) over the course of 2006.
- Fishmeal/Soybean meal price ratio is normally around 2; during this past year it exceeded 6.
- El Niño Event confirmed for 2006 and was stronger than initially forecast.
 - Catches for 2007 not expected to be much higher than 2006 harvest levels)

Recent Industry Developments

Fishmeal and soymeal prices



Recent Industry Developments

Ratio fishmeal prices versus soymeal prices

