The Lehman Wave

What really happened in the Financial Crisis?

Robert Peels

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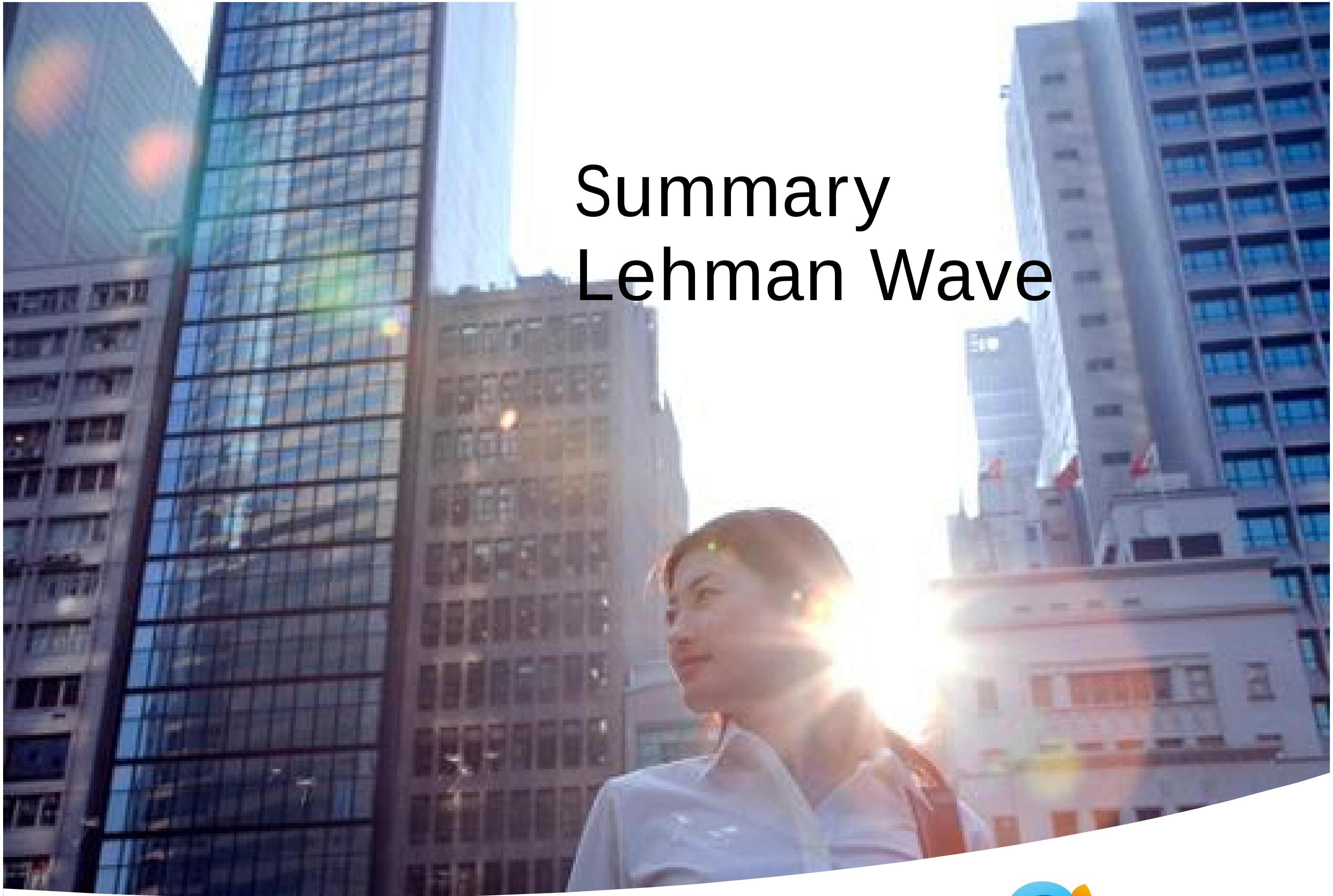
HEALTH · NUTRITION · MATERIALS

Summary
Lehman Wave



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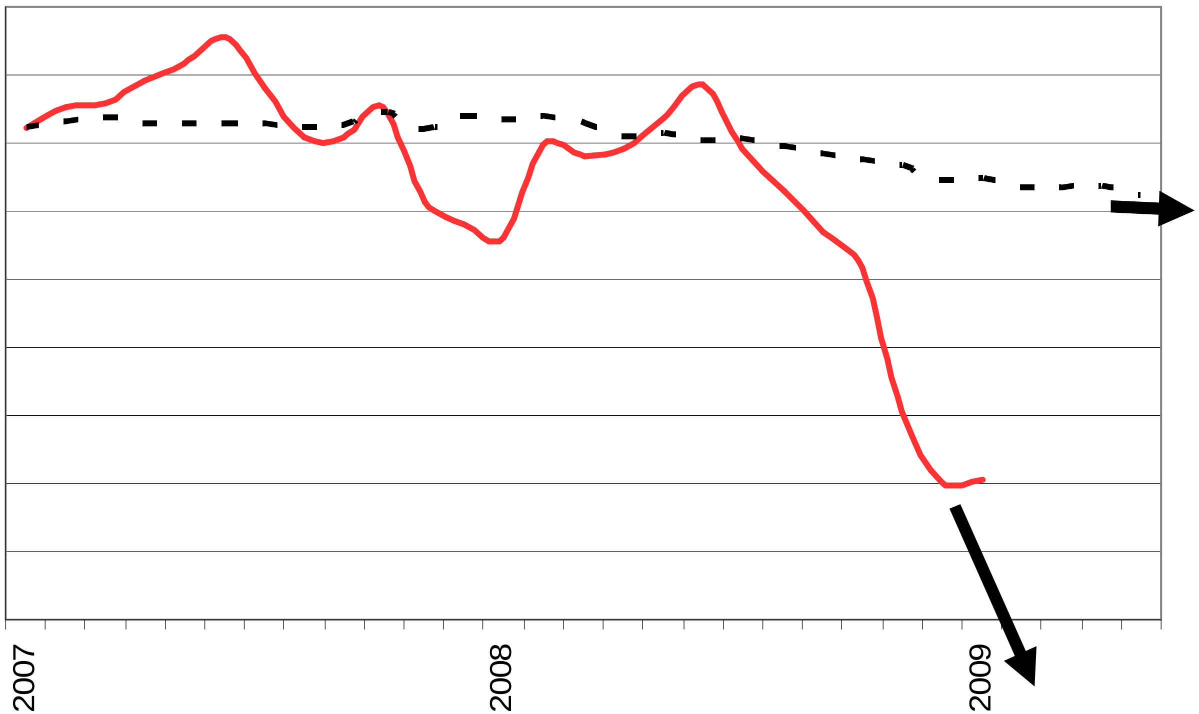
Observations in 2008



Retail
GDP
Construction

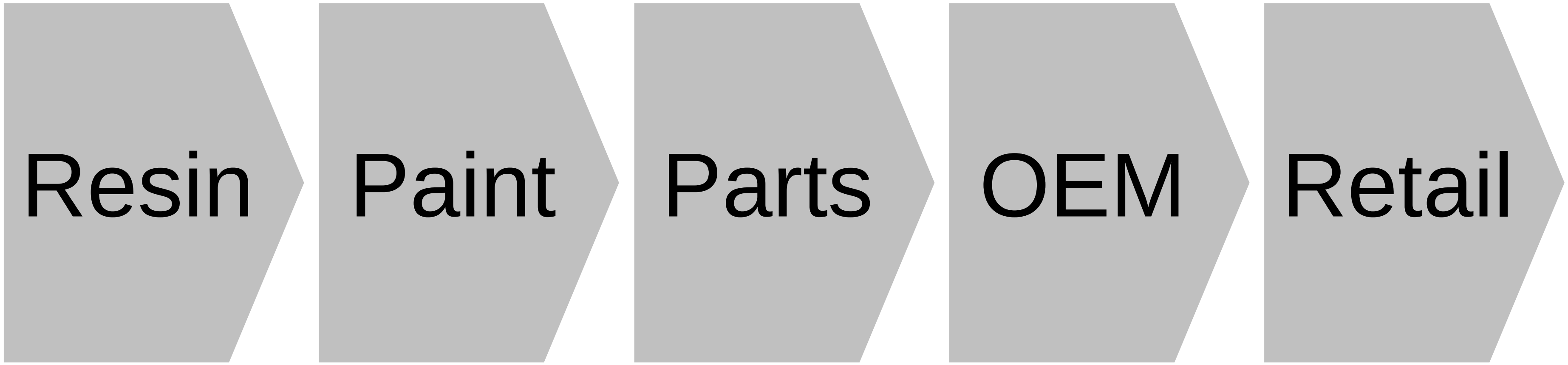
Sales
Banks
Cars,
Stock markets
Consumer confidence
Commodity prices

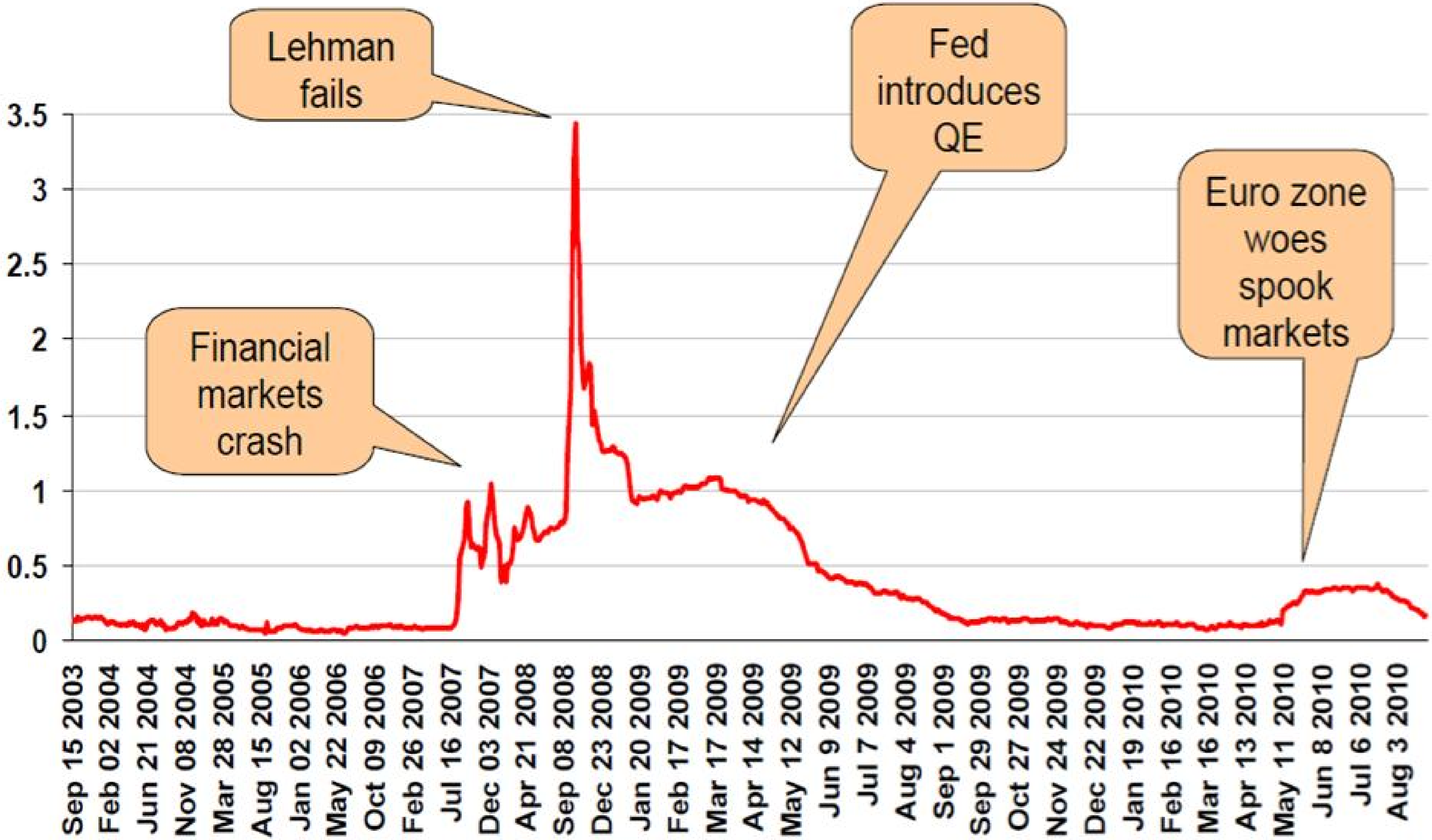
Many producers in the industry saw demand for their products decline sharply.
The media brought very bad news about banks, insurance companies, car sales, and housing markets. Stock markets plummeted, consumer confidence went down to lowest level since recording history. Commodity prices (oil, steel, wood) declined sharply after rising for years.
Nevertheless the ECB predicted a GDP growth for Europe in 2009 of about 0 to -2%, and various retail organizations reported normal sales levels.

Based on that info Peels drafted the following hypothesis in December 2008:

The bankruptcy of Lehman Brothers in September 2008 triggered global de-stocking, which resulted in a very strong decline of sales for companies high up the value chain.

This is a simplified version of the supply chain of DSM in Coating Resins.





3-month LIBOR/3-month overnight index swap (OIS) spread, percentage points.
A higher spread denotes more market stress. Sources: Haver Analytics; Economist Intelligence Unit.

The cause for the Lehman Wave is through stocks and thus thru capital, thru credit. This is the Libor interbank rate.

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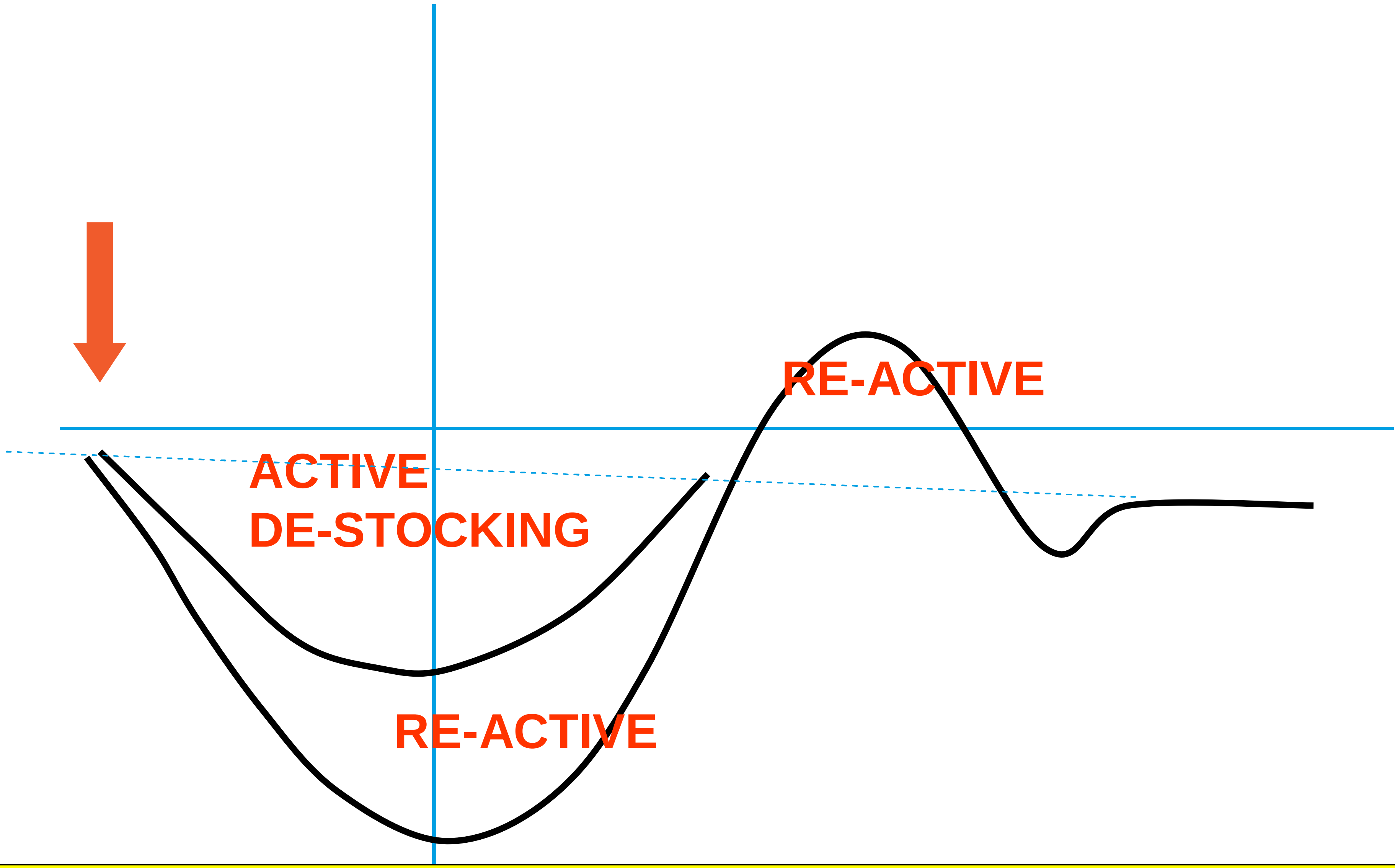
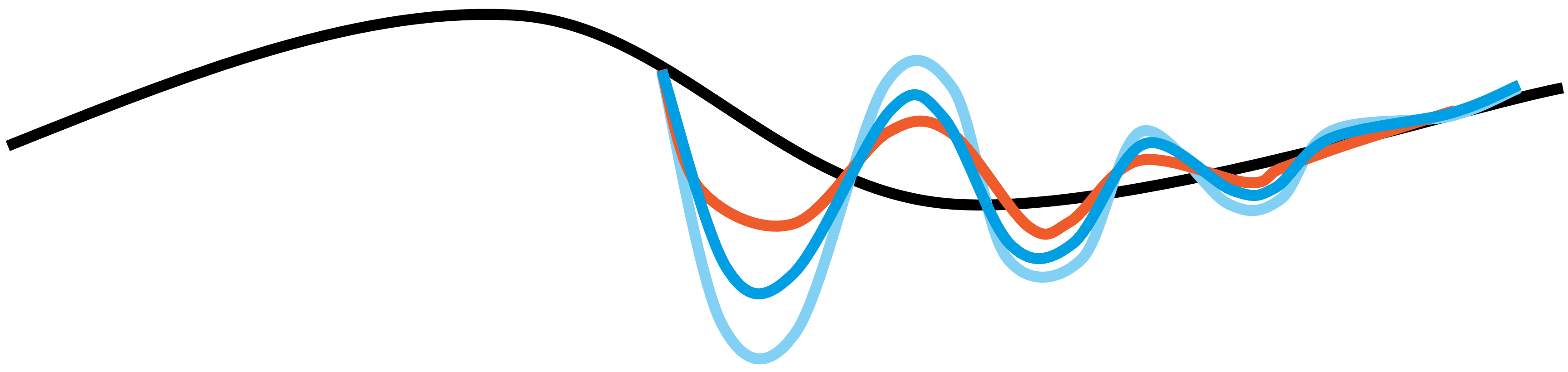
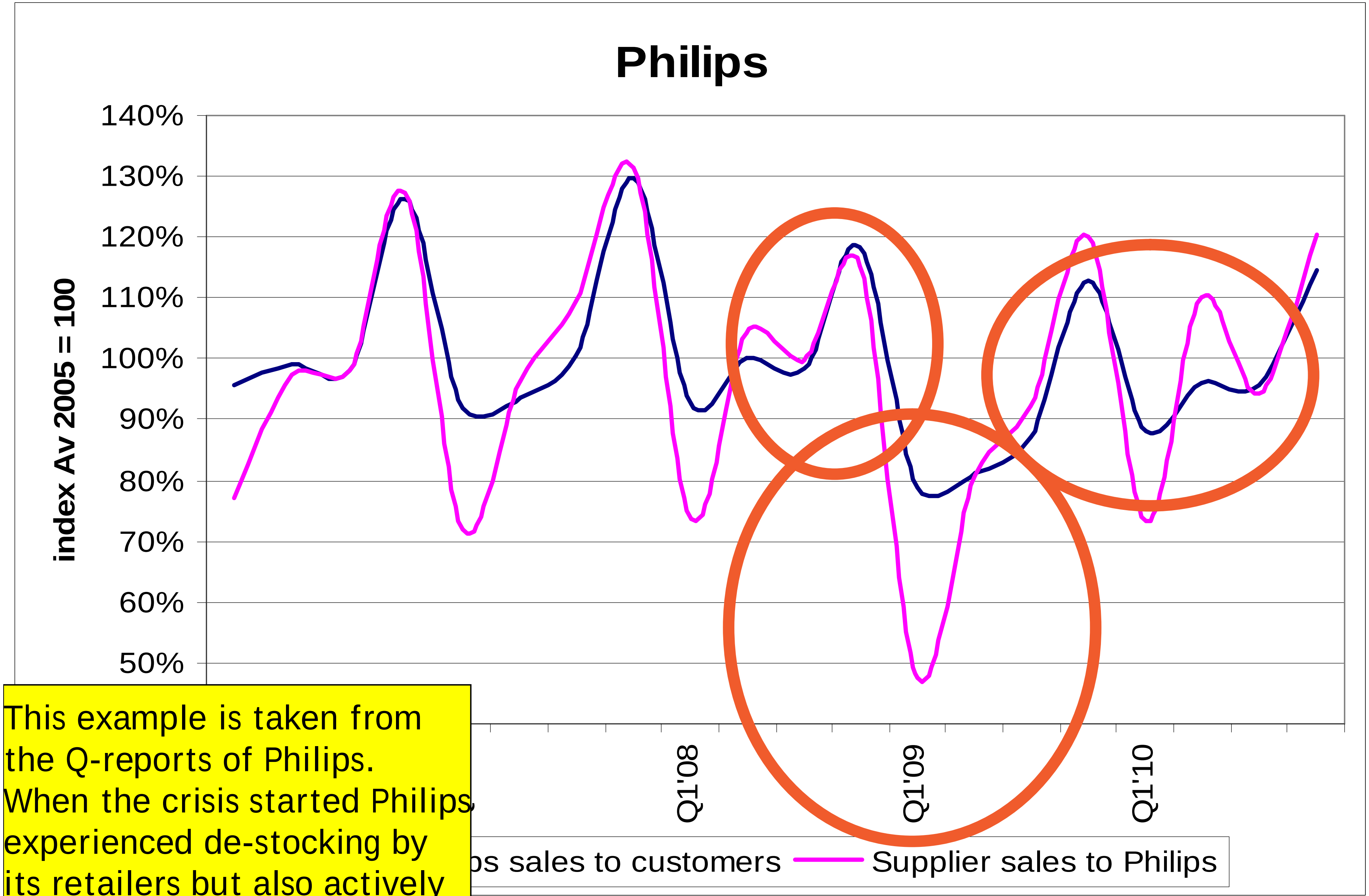


Based on telephone interviews and market research this picture could be drawn. Active de-stocking is a reduction of the stock/sales ratio, based on a CFO decision. Re-active de-stocking is the automatic response by a company if sales goes down. Once Active de-stocking has been implemented, sales levels should go up again and reactive re-stocking will take place, possibly causing an upward peak.

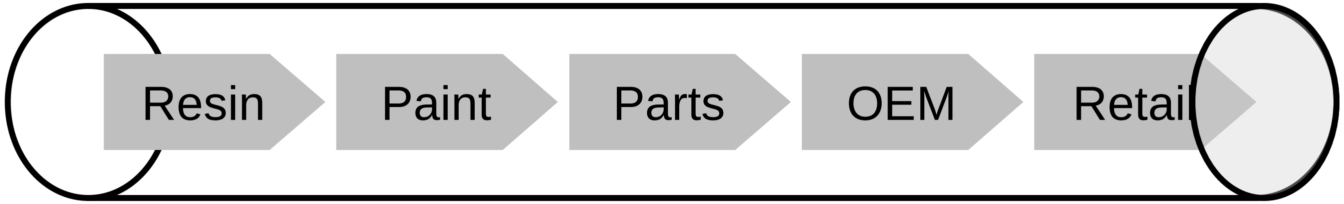


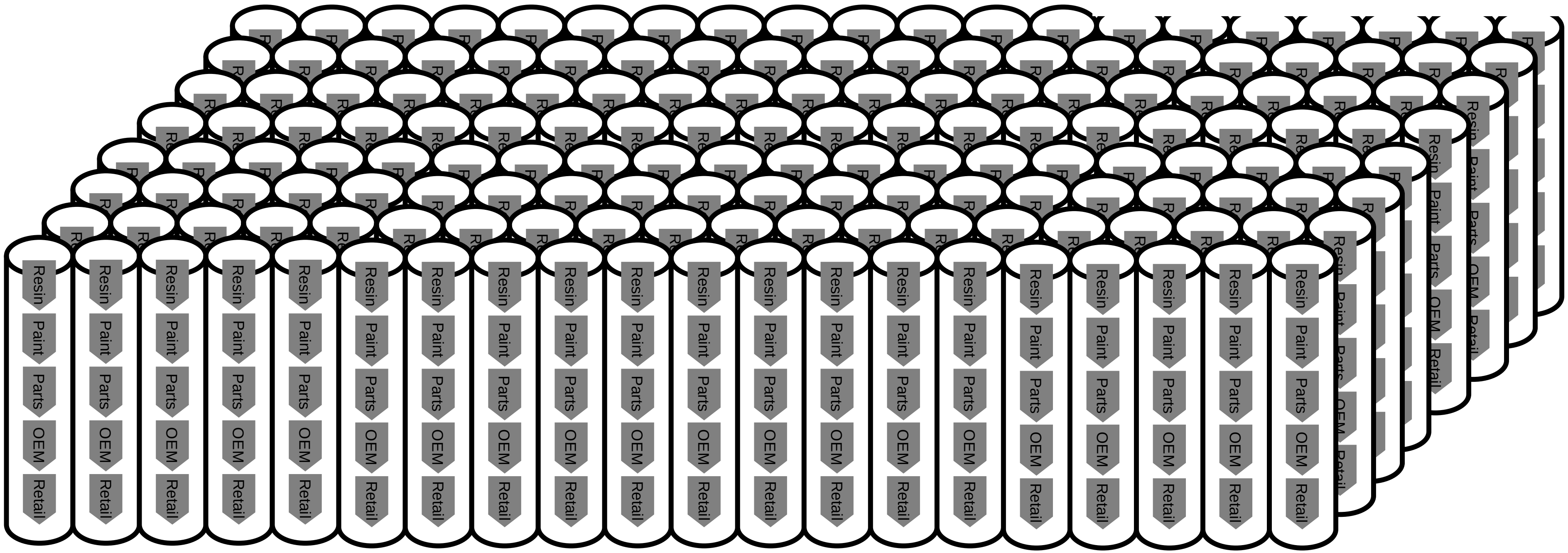
The “Lehman Wave”

The black line is the long term economic curve. The red line is the demand fluctuation experienced by a first echelon supplier to the end markets, caused by destocking of the retailer. The further away from the end markets, the deeper the sales dip was. It all started at September 15, 2008.



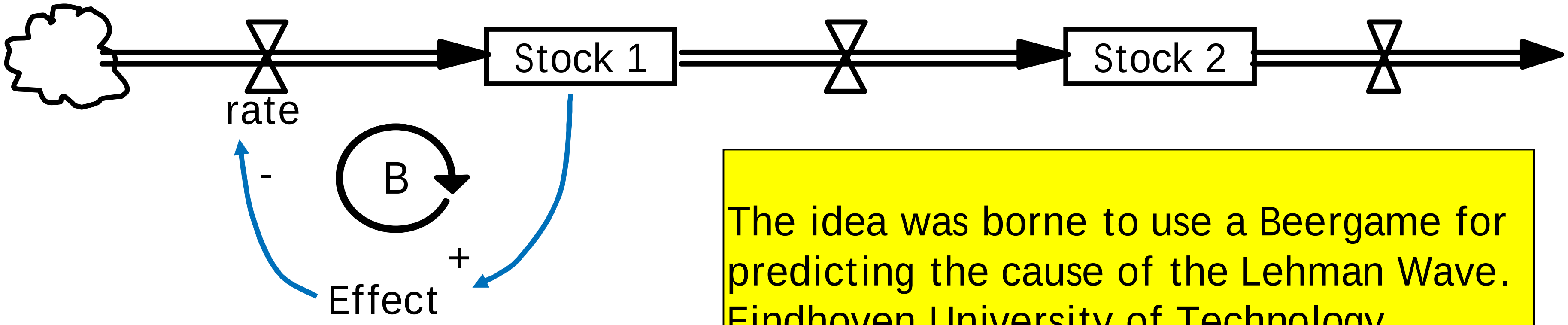
This example is taken from the Q-reports of Philips. When the crisis started Philips experienced de-stocking by its retailers but also actively de-stocked itself. Later it reactively re-stocked.





A supply chain is elastic by nature. All chains together form the stock keeping part of our economy, which has the shape and function of a mattress. If you lie on it and you move, the mattress will accommodate you and dampen the movement. But if you JUMP on it, the mattress will move strongly down, then move back up again, and up and down again. Like a trampoline. This elasticity is what is determining the shape of the Lehman

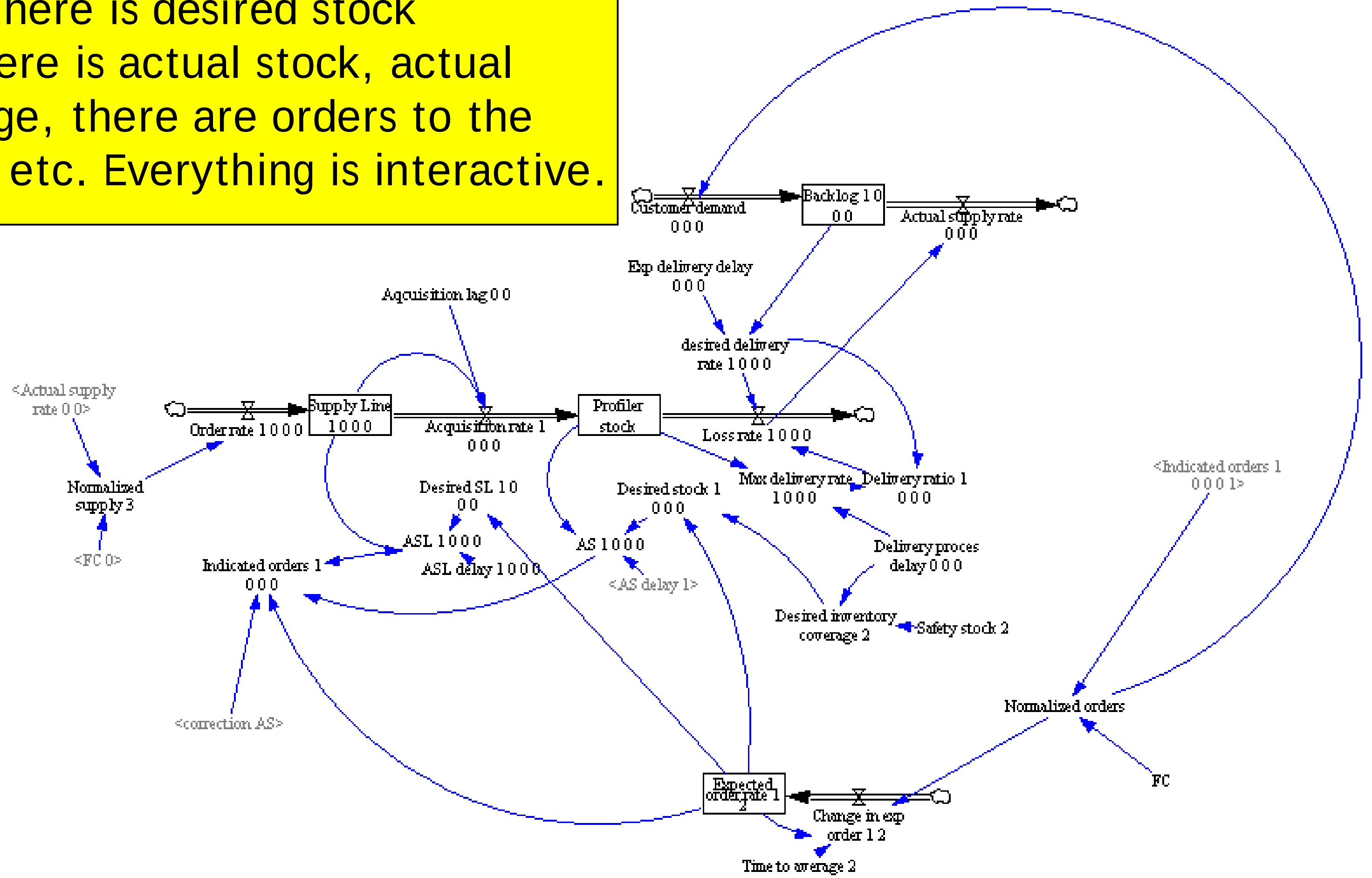
System Dynamics



The idea was borne to use a Beergame for predicting the cause of the Lehman Wave. Eindhoven University of Technology proposed to use System Dynamics software and they built the model.

One of the echelons in value chain

this is one echelon = one step in the value chain. In fact it is the ERP system (e.g. SAP) of a company. Orders come in, there is planning, there is desired stock coverage, there is actual stock, actual stock coverage, there are orders to the supplier, etc etc. Everything is interactive.



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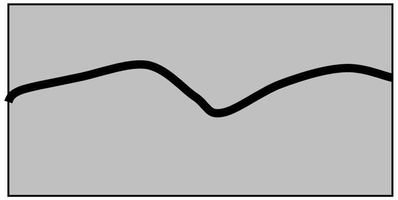
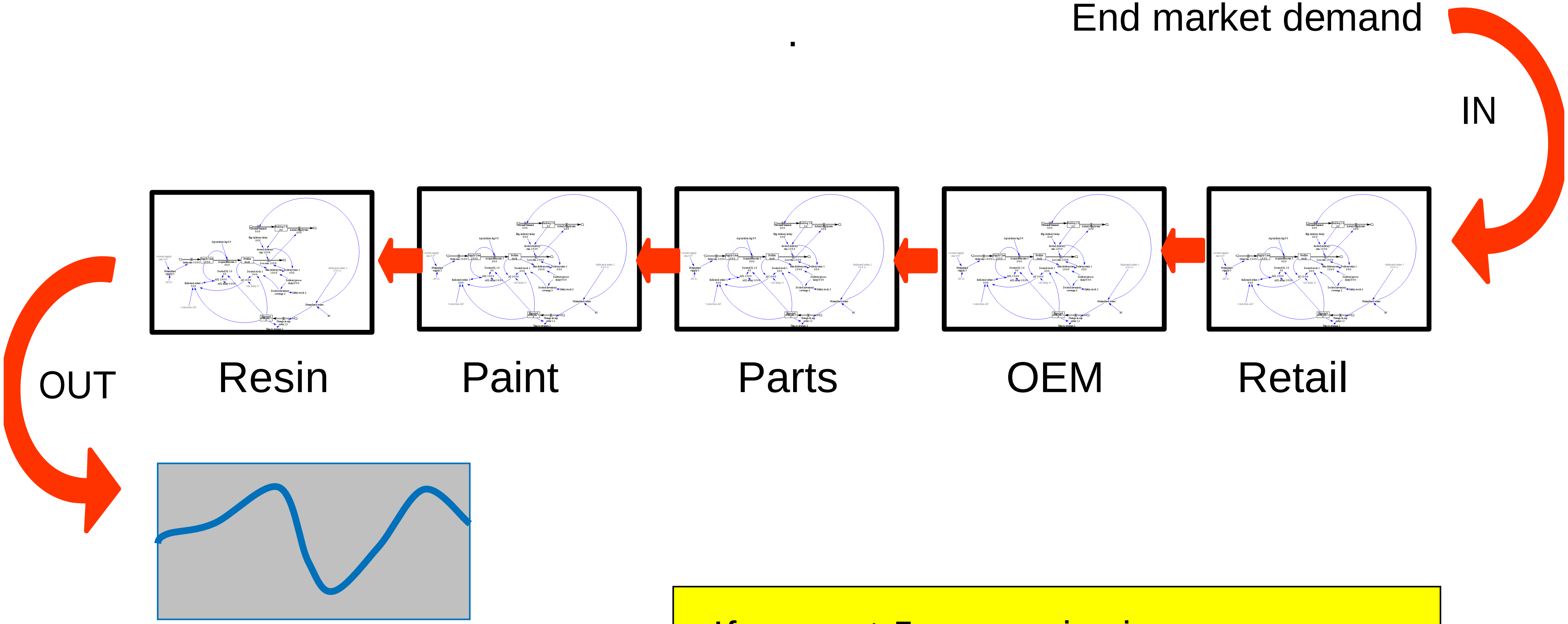
Dynamic modeling

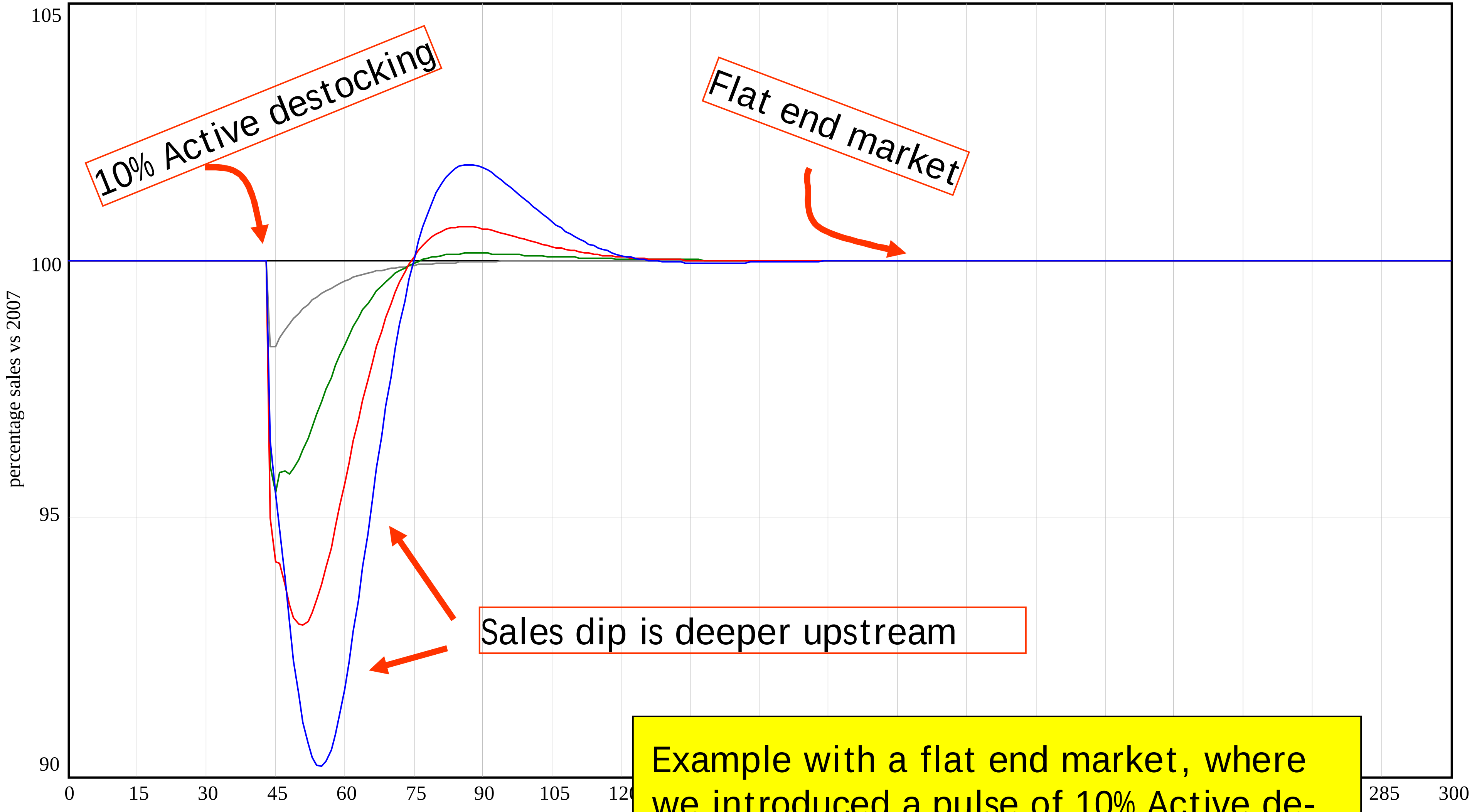


End market demand



Upstream demand

If you put 5 companies in a row, you have a supply chain; and a beer game. If you put an end-market curve in, you get a demand curve out of it.



Example with a flat end market, where we introduced a pulse of 10% Active de-stocking in week 44. The response is stronger for companies higher in the supply chain.

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Lehman Waves for DSM

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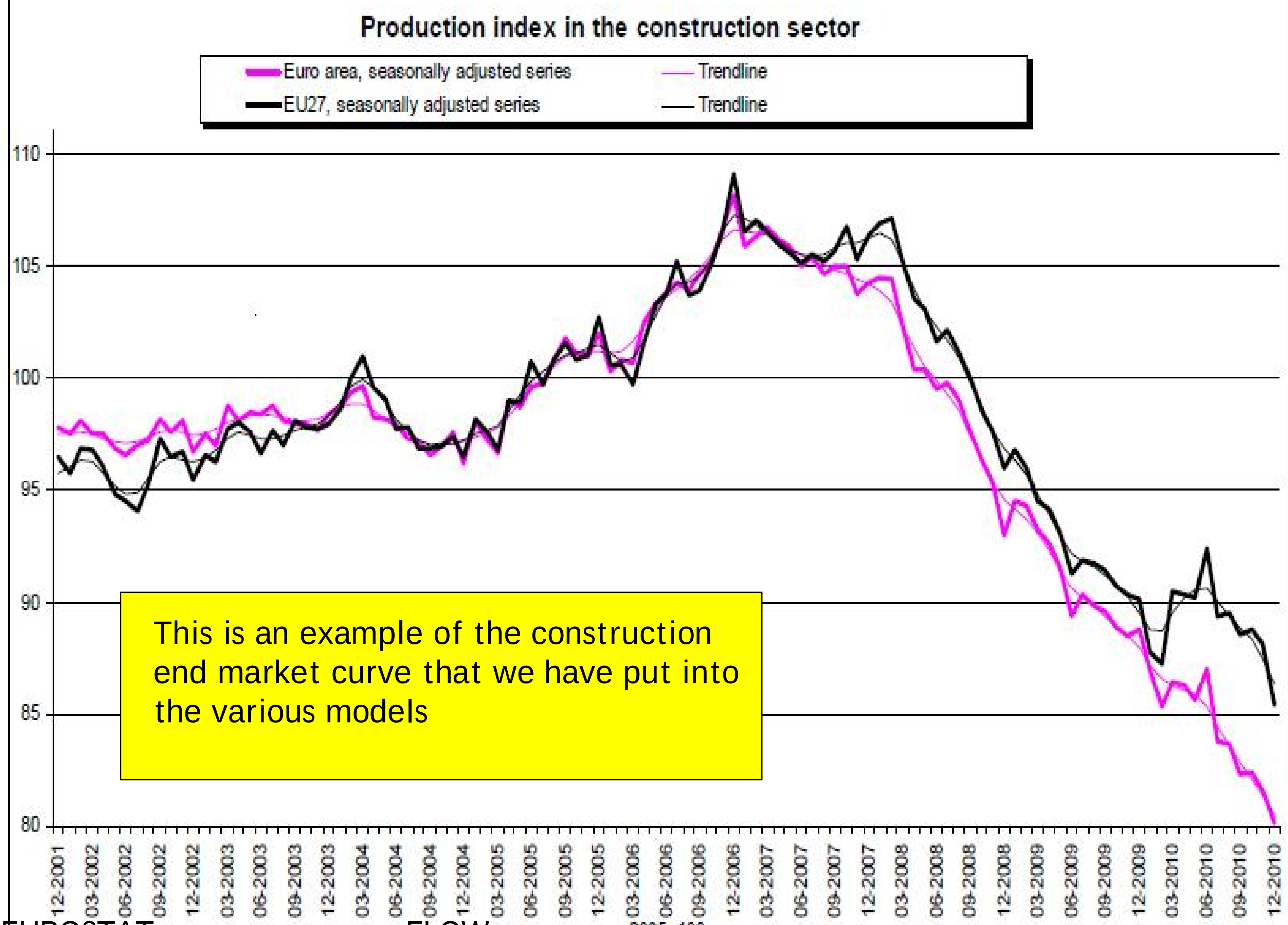
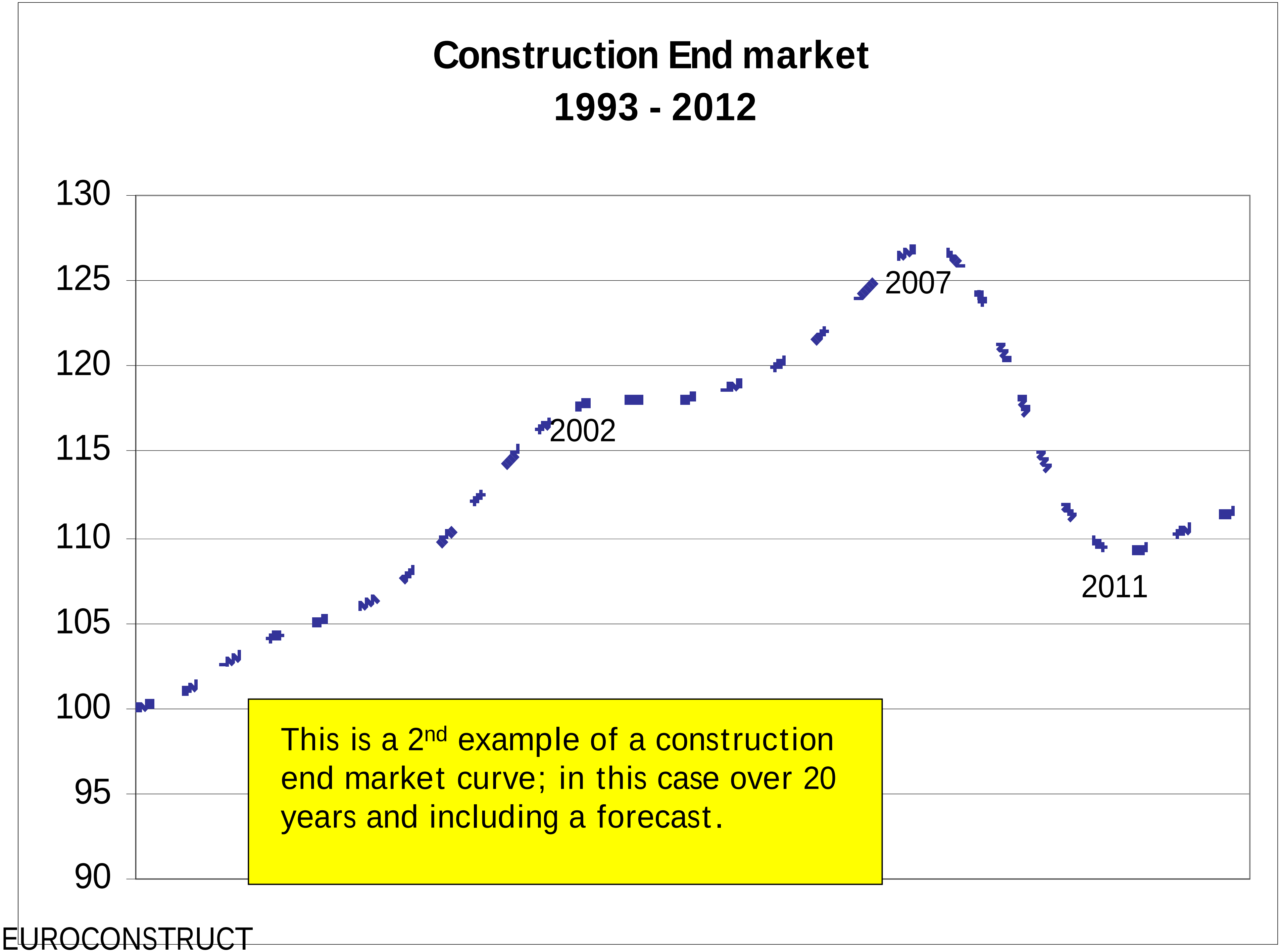


This is an example of the construction end market curve that we have put into the various models

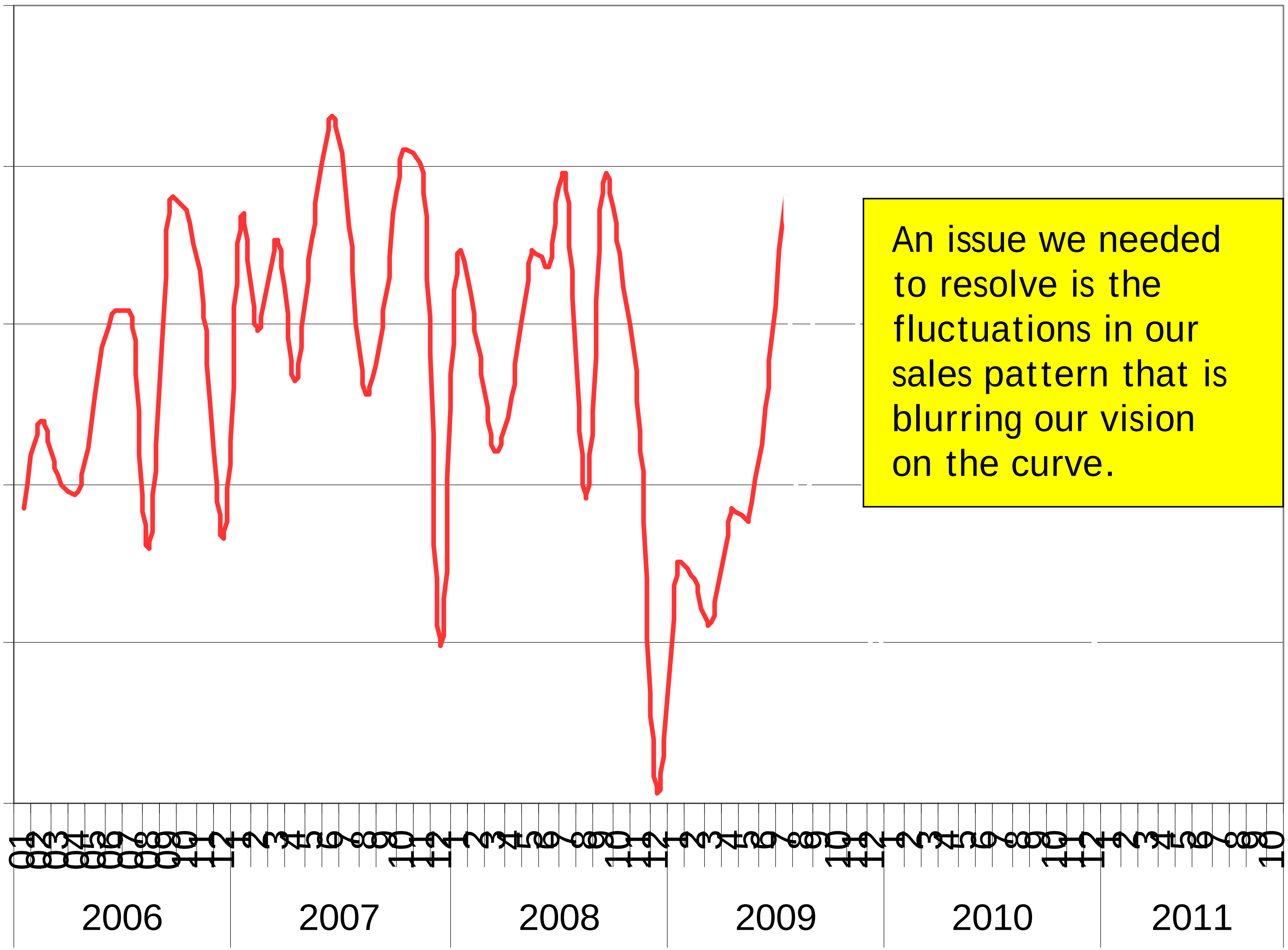
EUROSTAT

FLOW

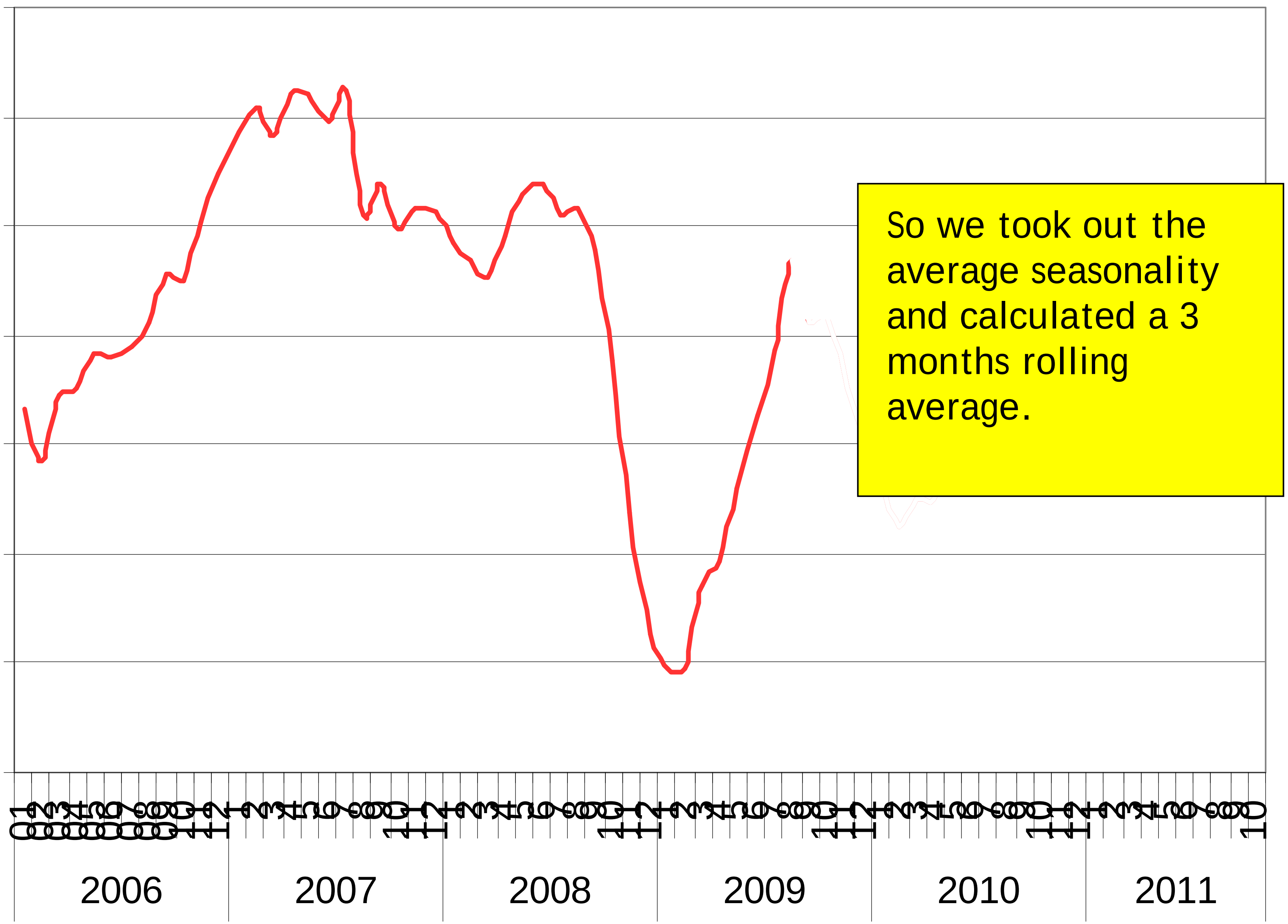


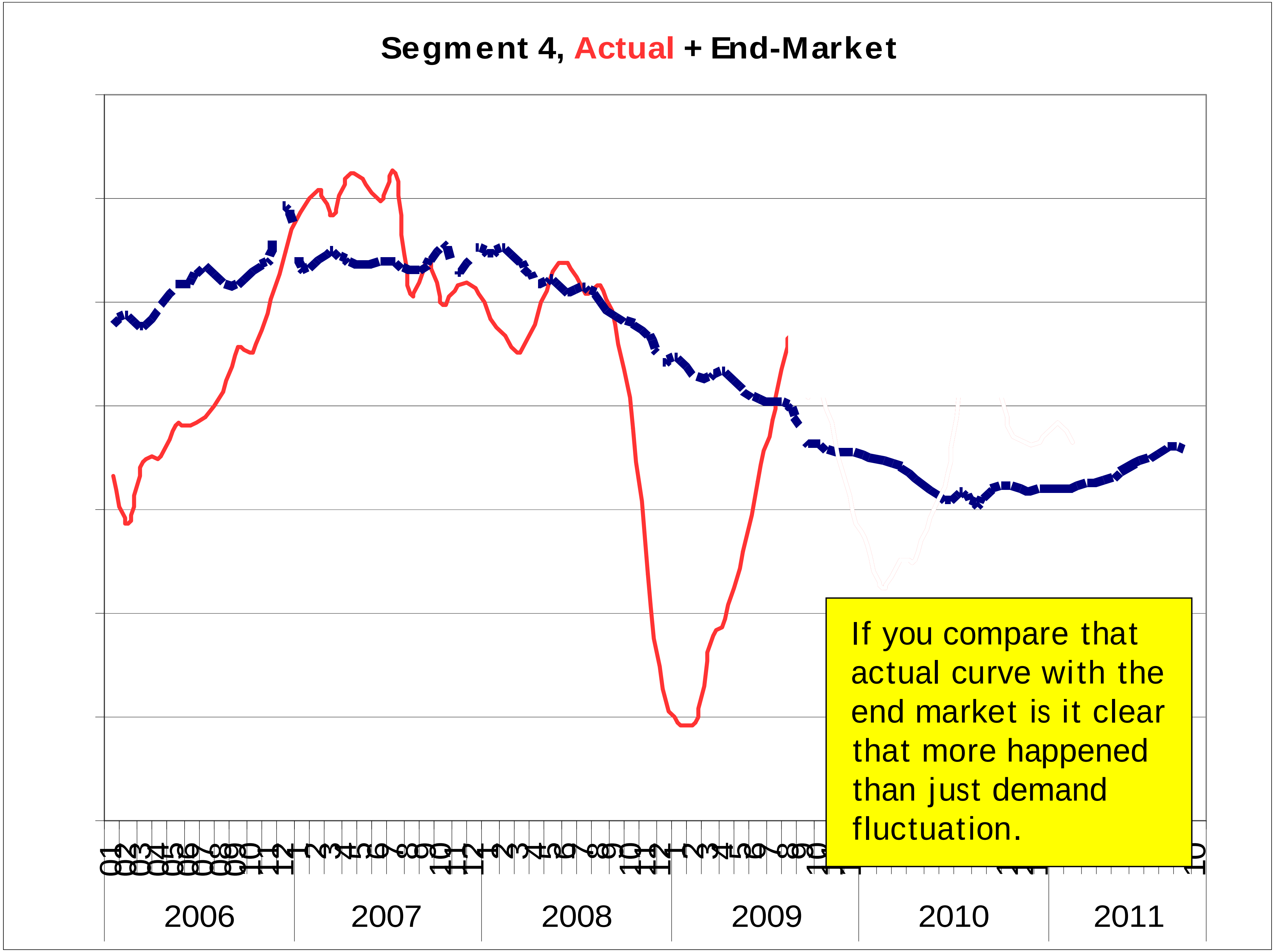
This is a 2nd example of a construction end market curve; in this case over 20 years and including a forecast.

Segment 4, Actual, with seasonality

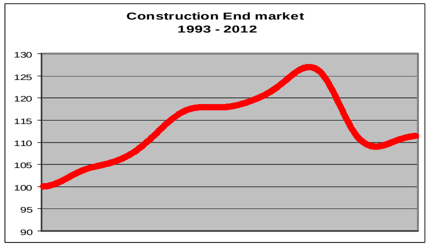


Segment 4, Actual




Segment 4, Actual + End-Market
2006
2007
2008
2009
2010
2011
If you compare that actual curve with the end market is it clear that more happened than just demand fluctuation.

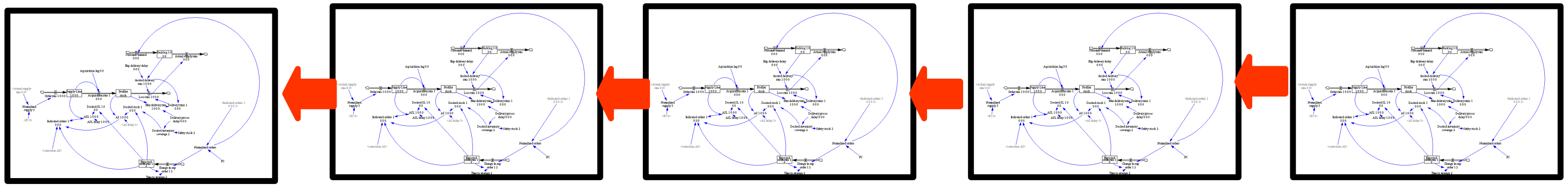
Dynamic modeling



End market demand

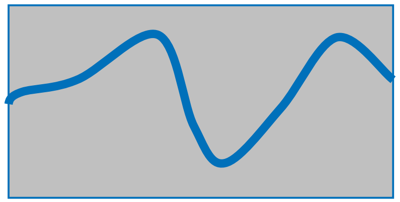
IN

-10% -10% -10% -10% -10%



Resin Paint Parts OEM Retail

OUT



Upstream demand

So we put in the end market and a 10% de-stocking pulse and run the model for a period of 5 years.

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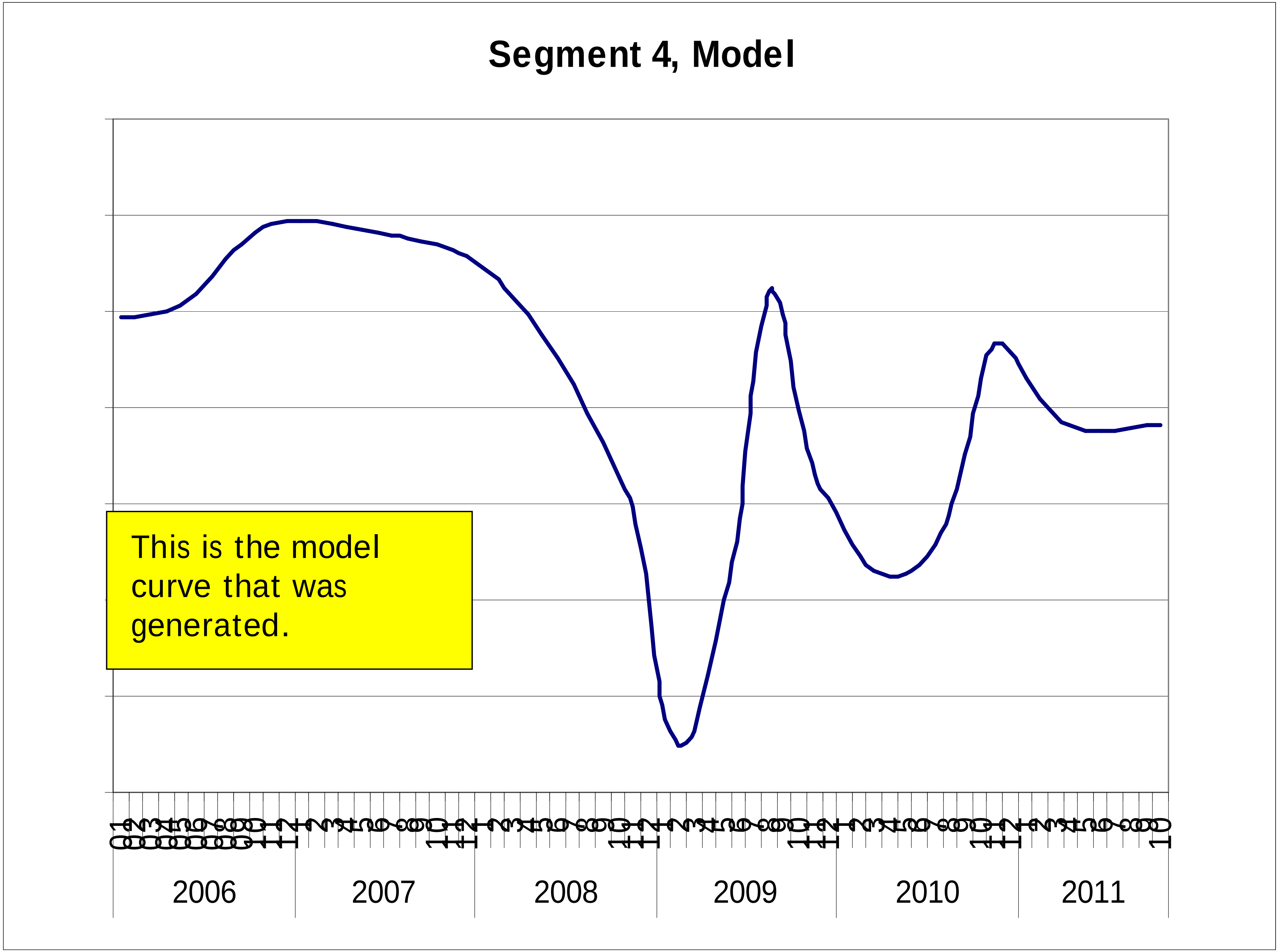
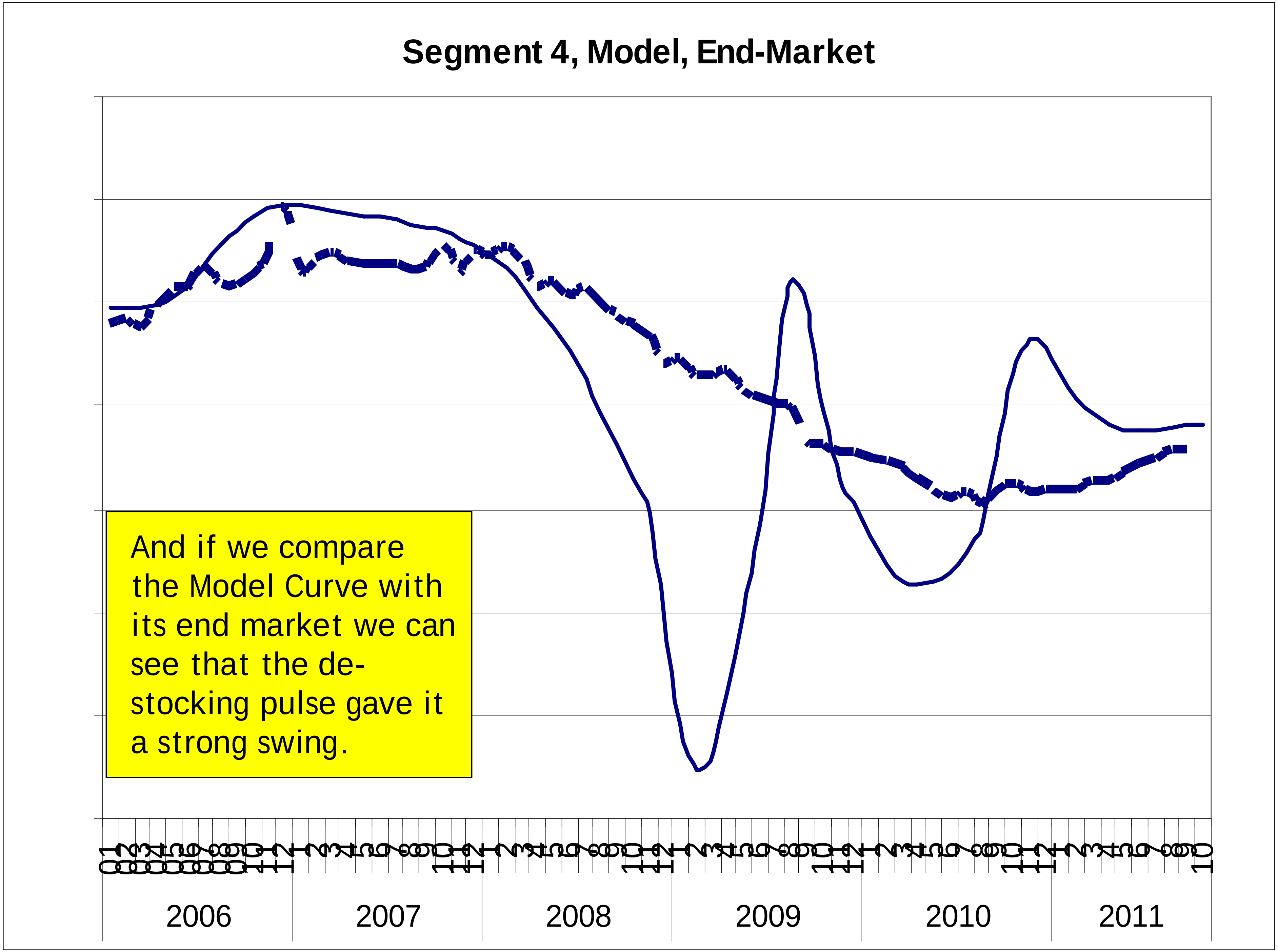
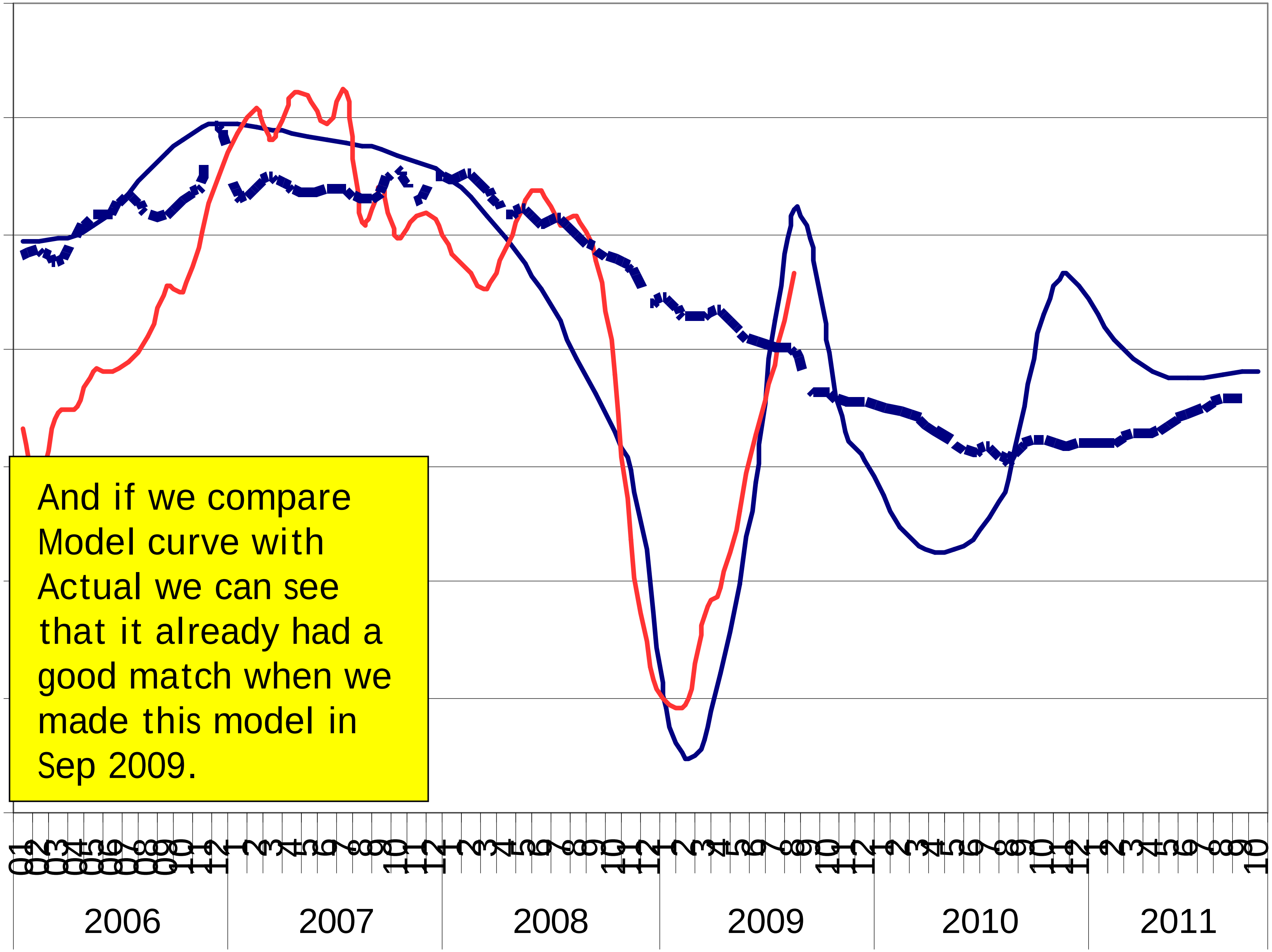

Segment 4, Model
This is the model curve that was generated.
2006
2007
2008
2009
2010
2011

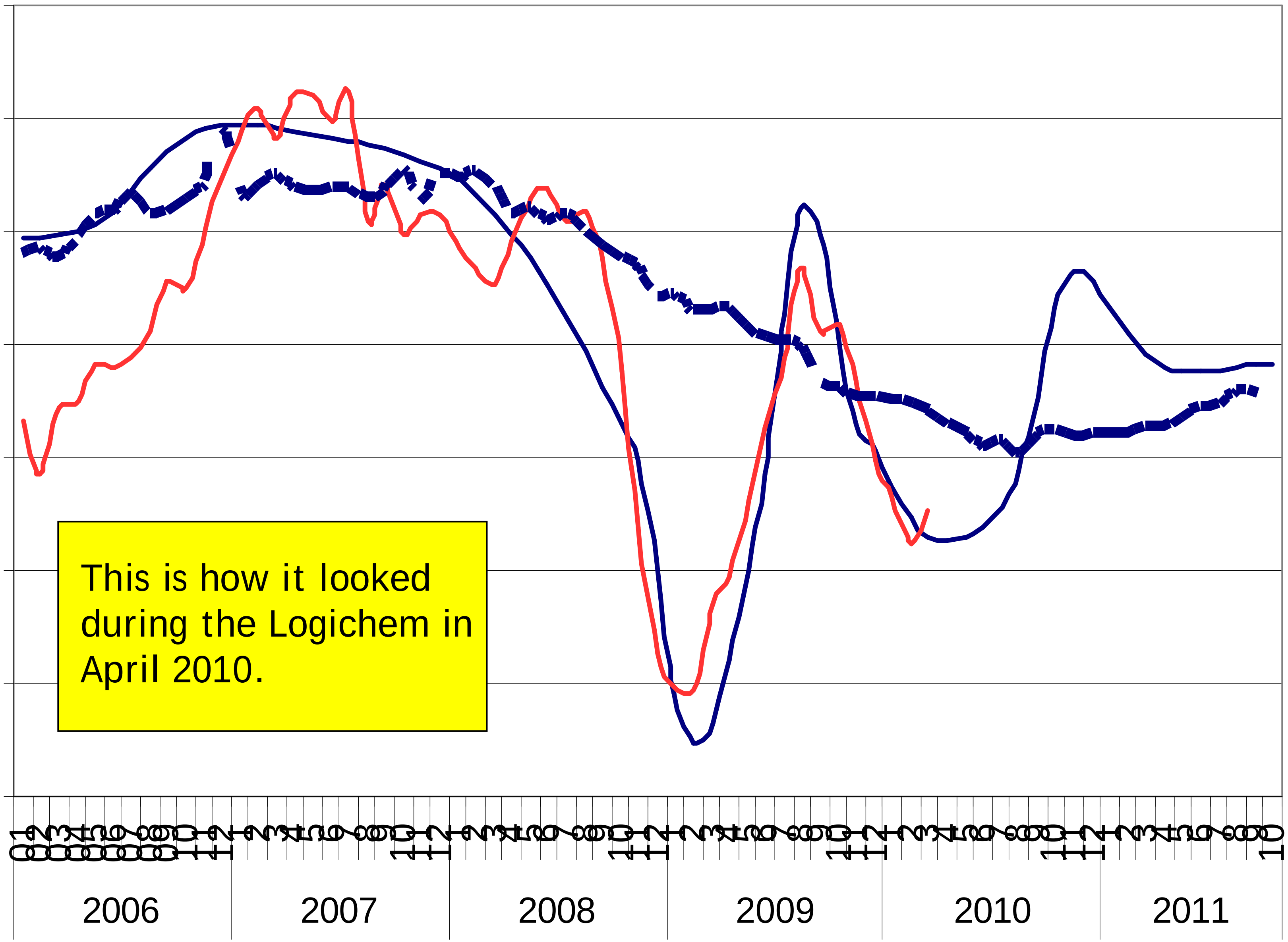

Segment 4, Model, End-Market
And if we compare the Model Curve with its end market we can see that the de-stocking pulse gave it a strong swing.
2006
2007
2008
2009
2010
2011

Segment 4, Actual, Model, End-Market in Sep 2009

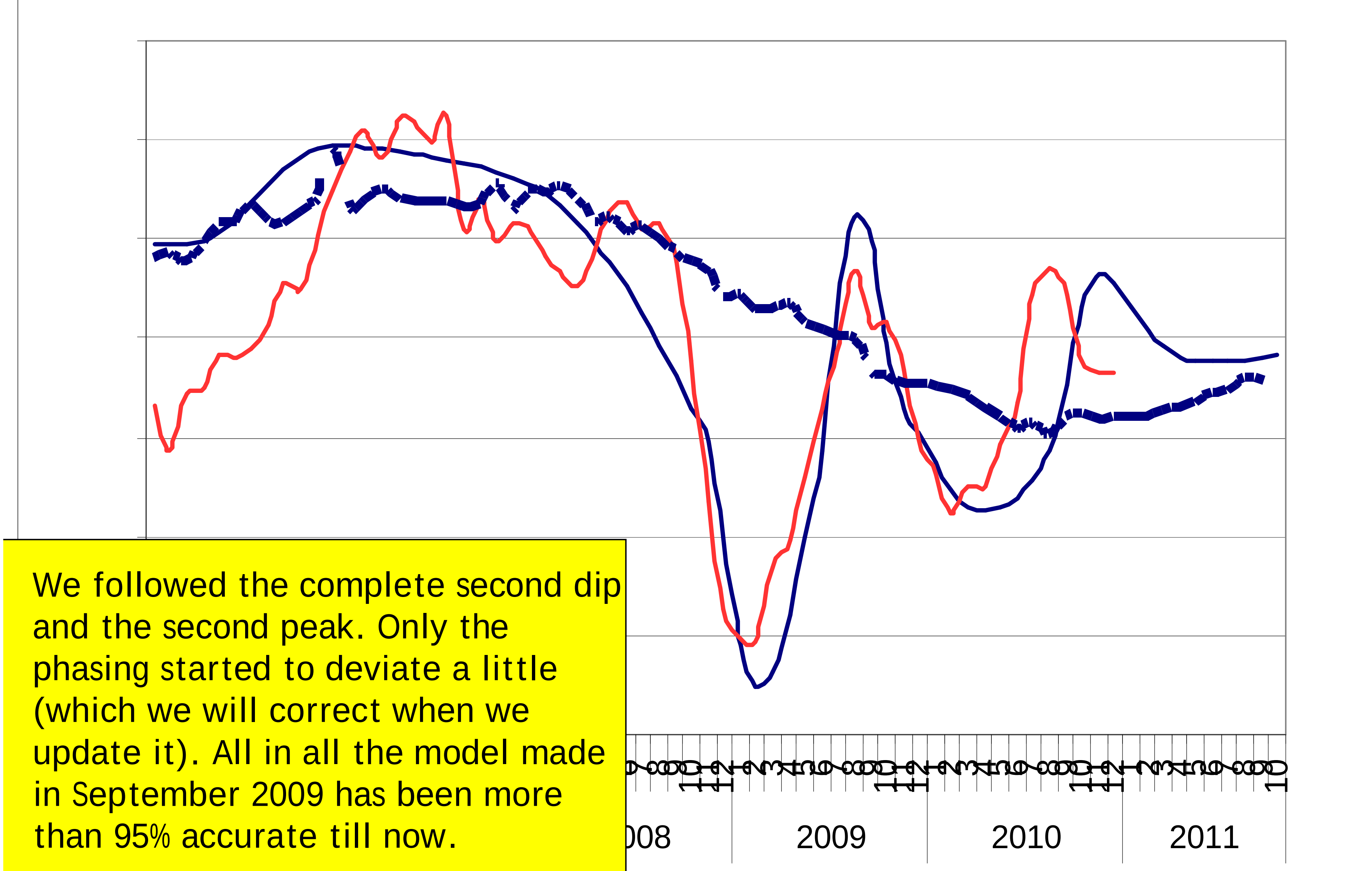


And if we compare Model curve with Actual we can see that it already had a good match when we made this model in Sep 2009.

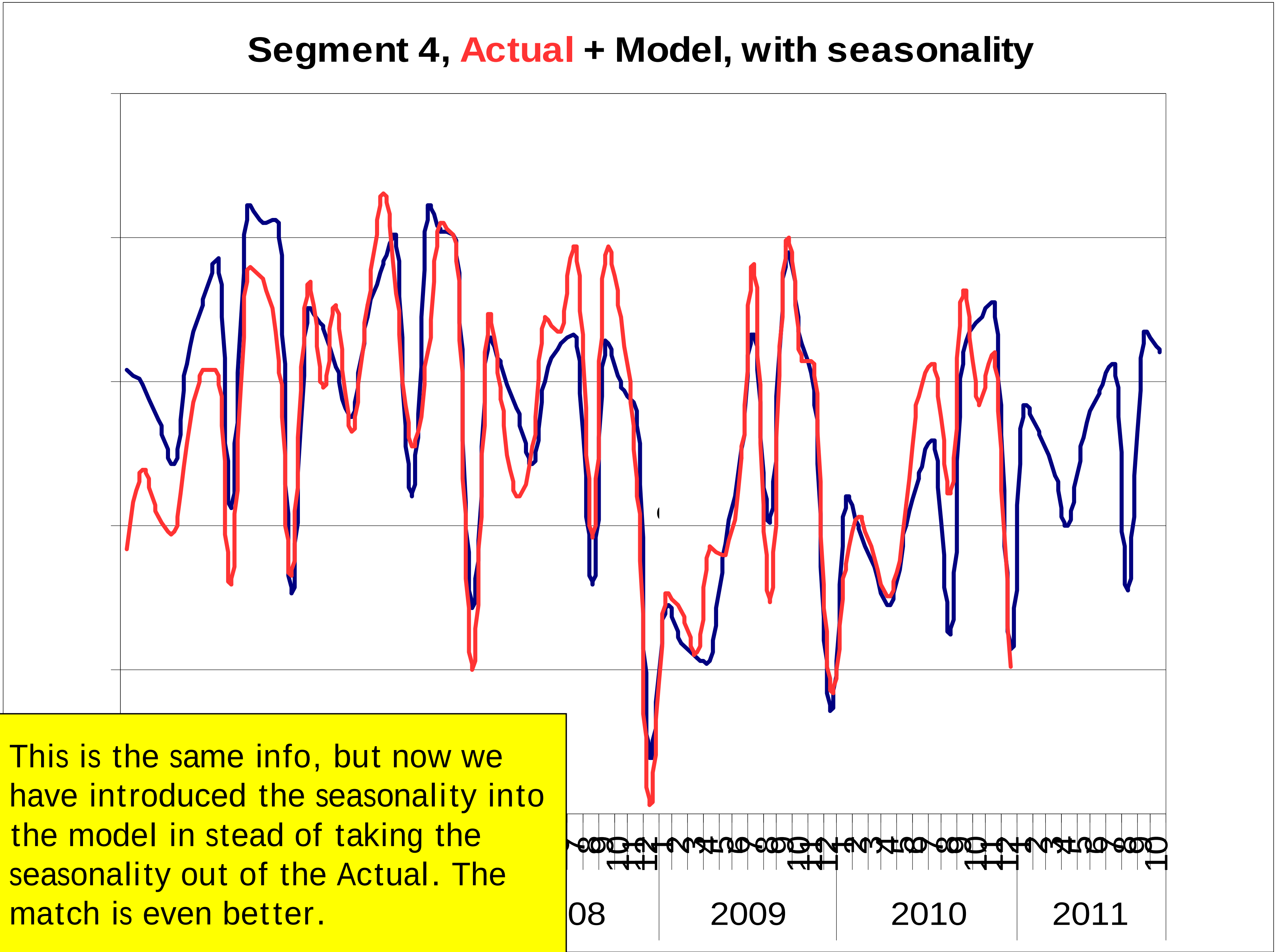
Segment 4, Actual, Model, End-Market at Logichem 2010



Segment 4, Actual, Model, End-Market till December 2010



We followed the complete second dip and the second peak. Only the phasing started to deviate a little (which we will correct when we update it). All in all the model made in September 2009 has been more than 95% accurate till now.



This is the same info, but now we have introduced the seasonality into the model in stead of taking the seasonality out of the Actual. The match is even better.

Modeling is being used in DSM's Supply Chain Management Centre of Excellence

The right team

- Multi-disciplinary (Finance / SCM)
- Mix of DSM and consultants
- True global program with 6 nationalities working in 3 continents

Data driven and fact based

- Advanced analytics
- Transaction based
- Rapid prototyping for fast customization and development

Encouraging environment

- Burning platform
- Top management support

Change Management

- Spread a CFO mindset
- Cash awareness sessions
- OWC trainings

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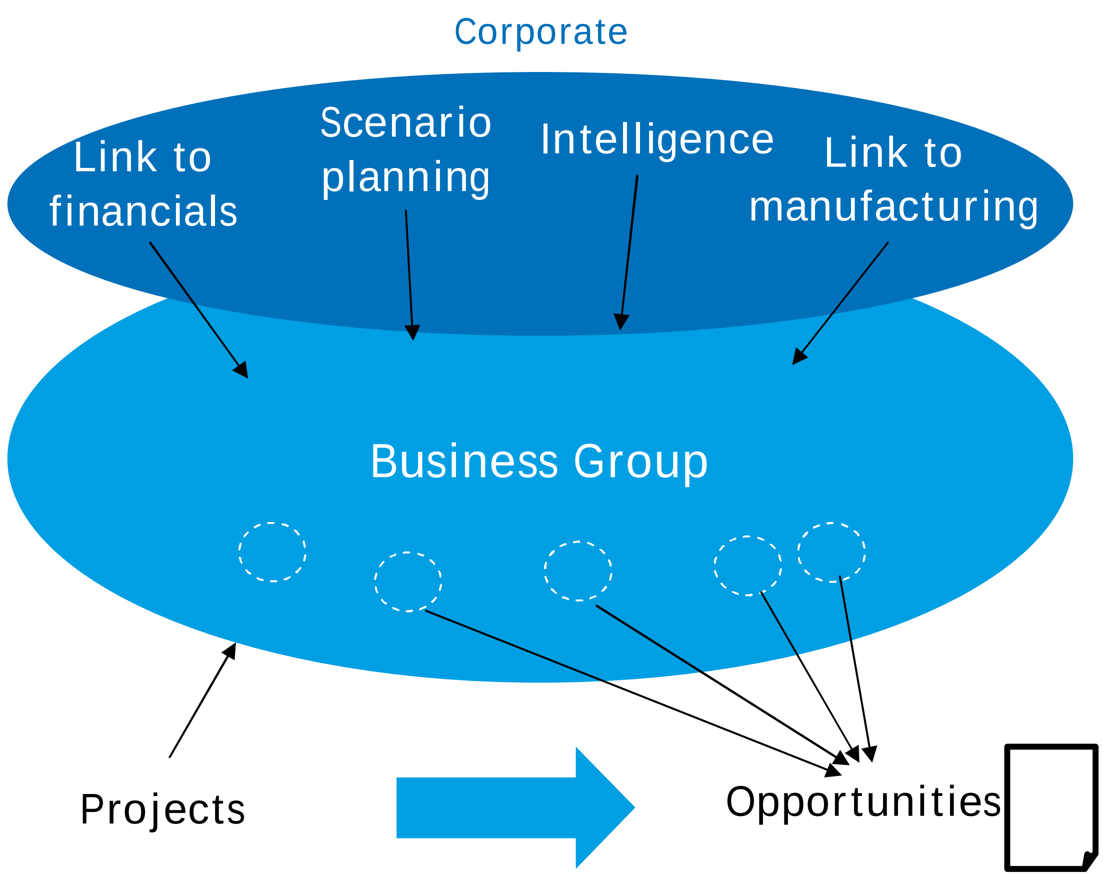
Tomorrow, SCM should be at the next level.



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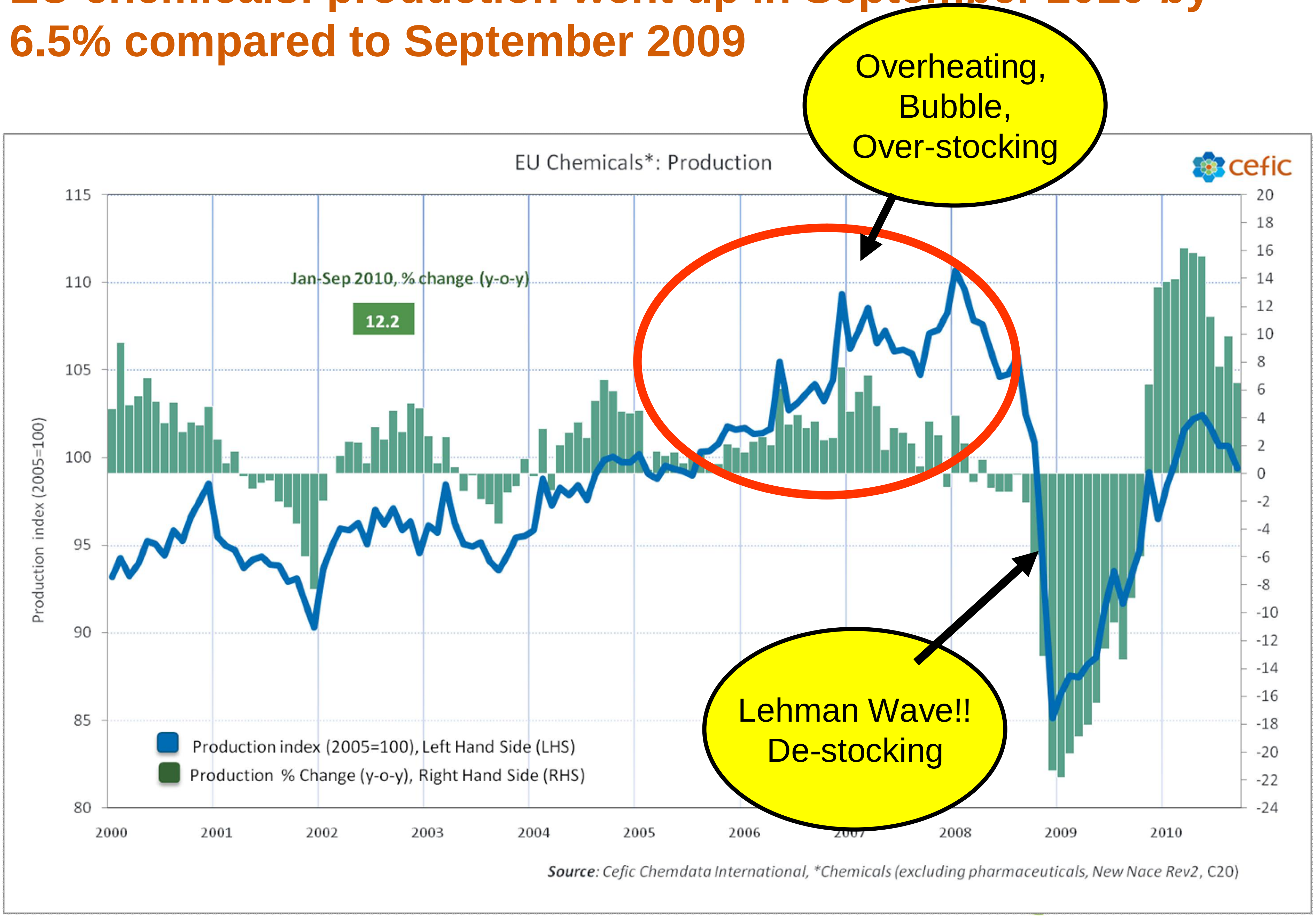
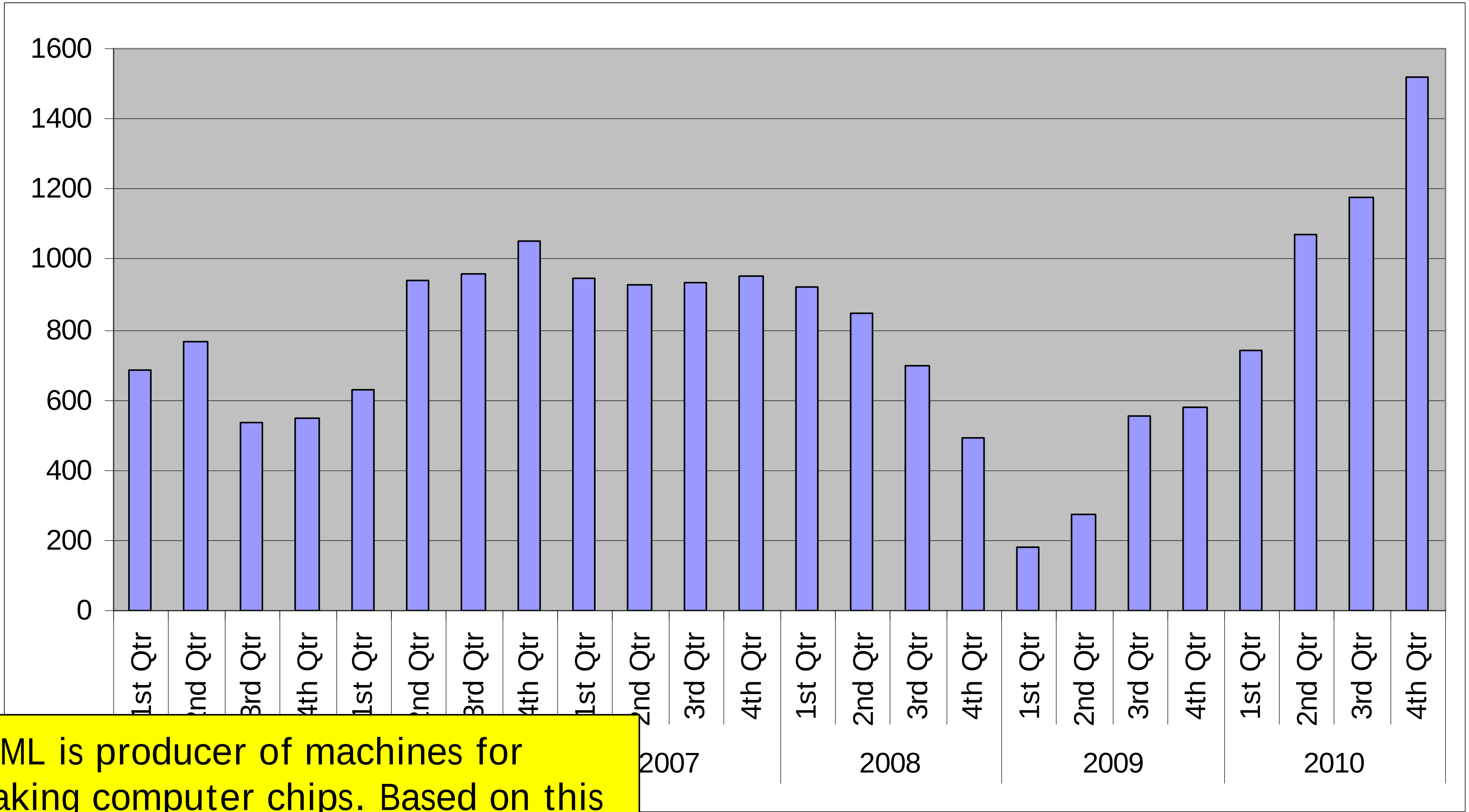
EU chemicals: production went up in September 2010 by 6.5% compared to September 2009



ASML



ASML is producer of machines for making computer chips. Based on this curve one can see that they are still in the aftermath of the Lehman Wave.

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Volkswagen

Auto Industry | 28.01.2011

German auto production is bursting at the seams

With demand outpacing production capacity, Volkswagen will idle production at its Wolfsburg facility for 24 hours. Supply chains, which atrophied during the recession, are now struggling to meet capacity.

Also Volkswagen is in the aftermath of the Lehman Wave.

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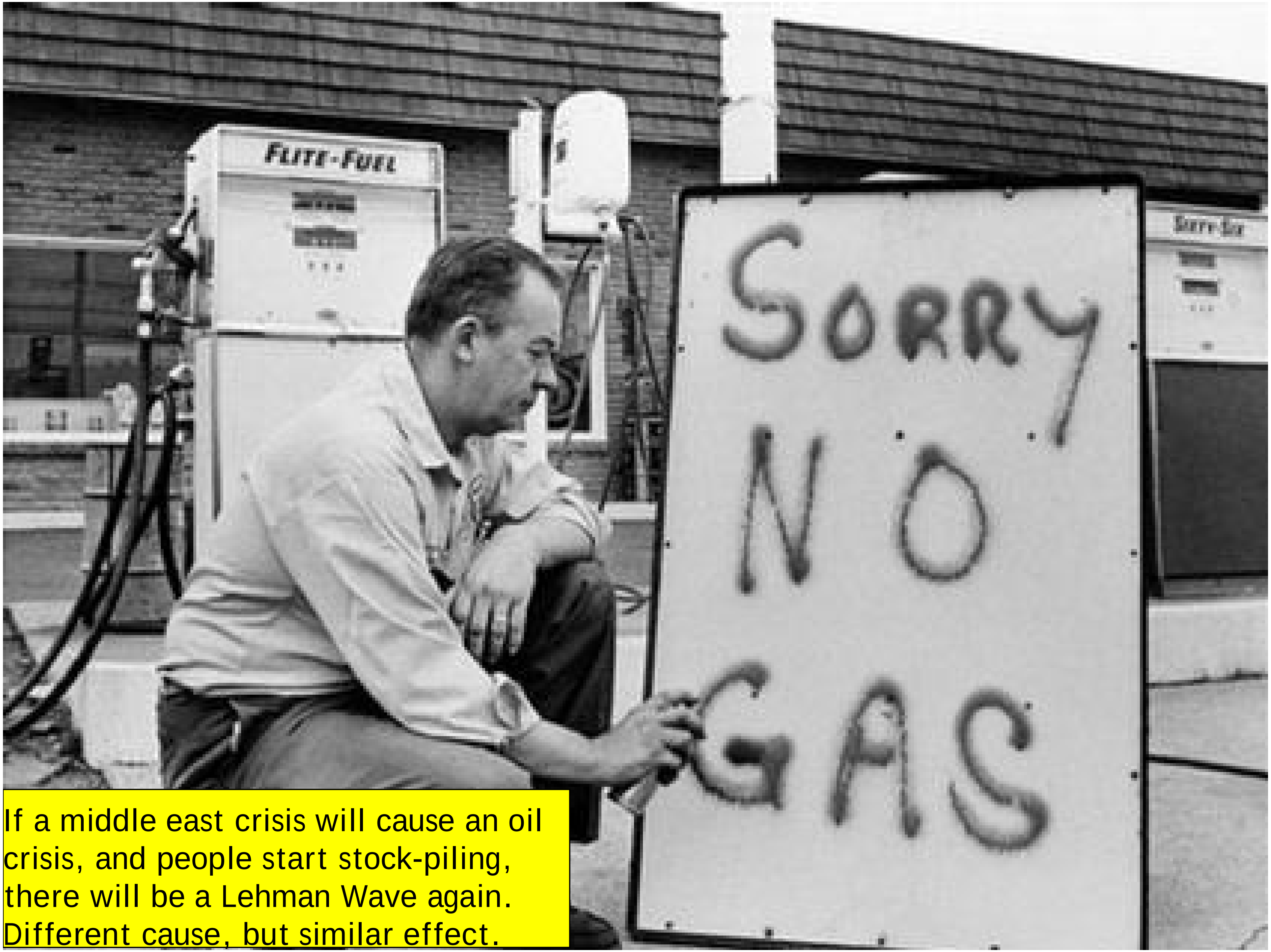
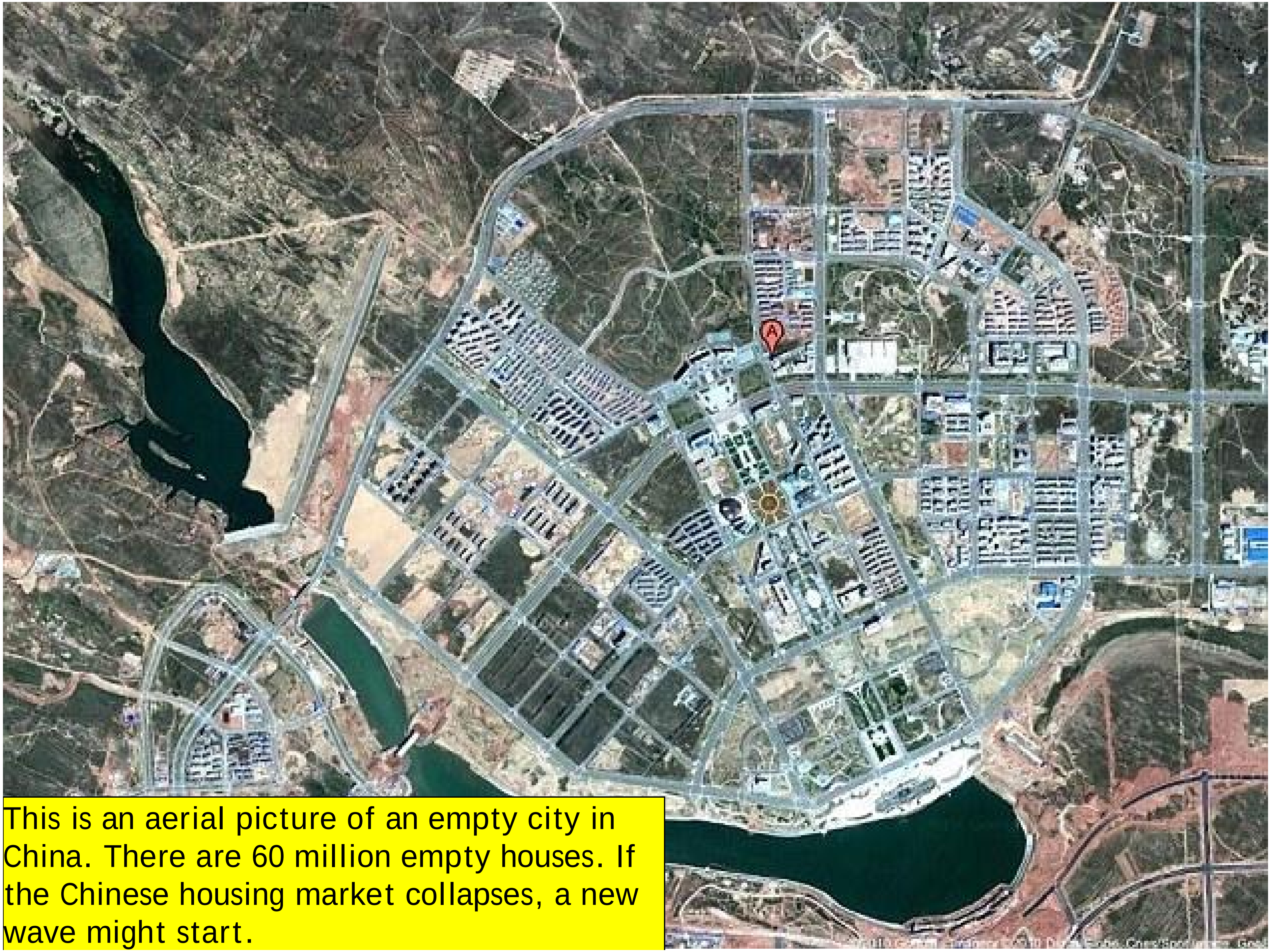
The disaster in Japan can cause significant effects in far away supply chains;

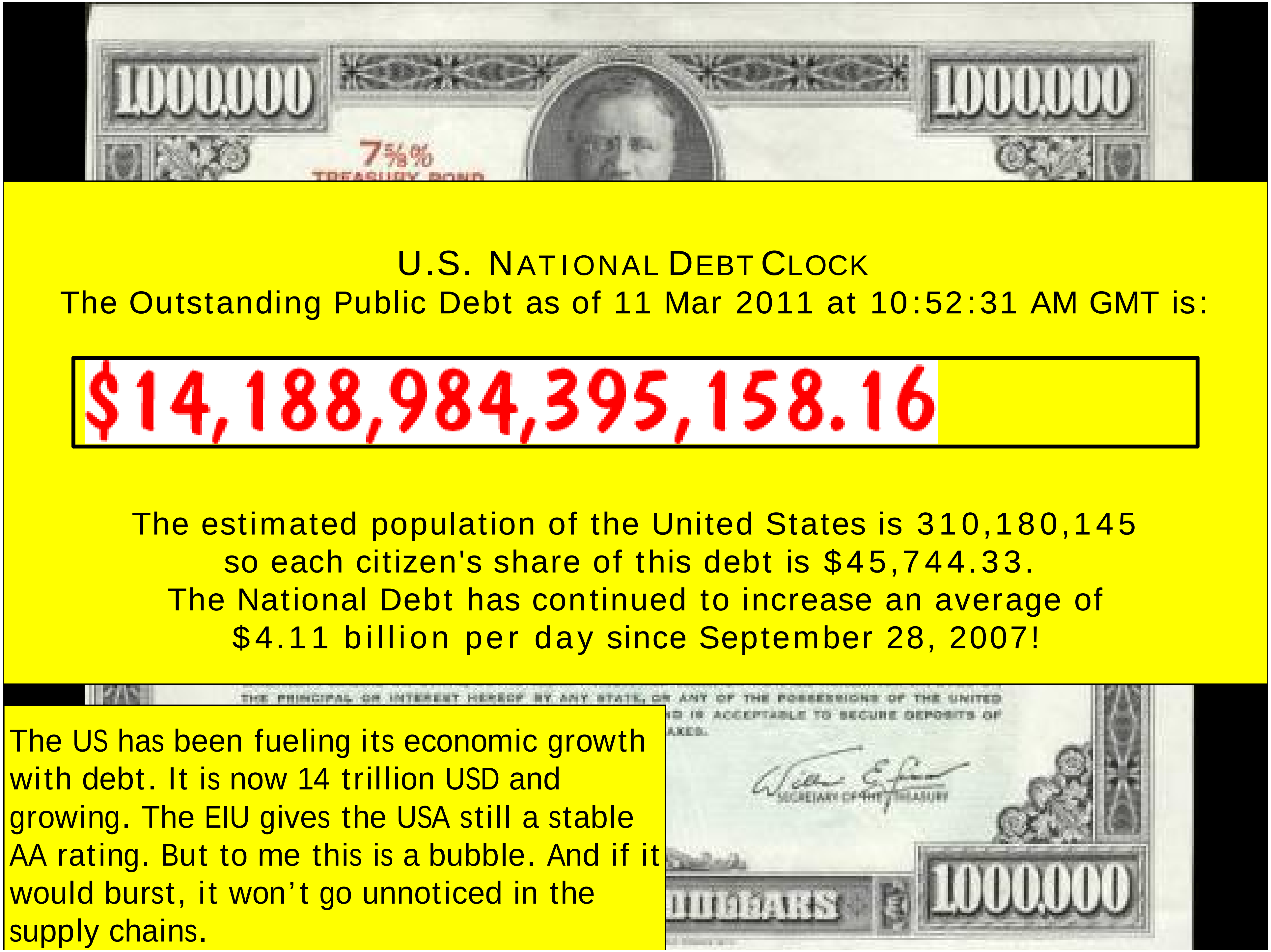


If a middle east crisis will cause an oil crisis, and people start stock-piling, there will be a Lehman Wave again. Different cause, but similar effect.



This is an aerial picture of an empty city in China. There are 60 million empty houses. If the Chinese housing market collapses, a new wave might start.

There are some financial imbalances in the Euro zone that will require action. If a country would go bankrupt, creating panic: boom! A new Lehman Wave.



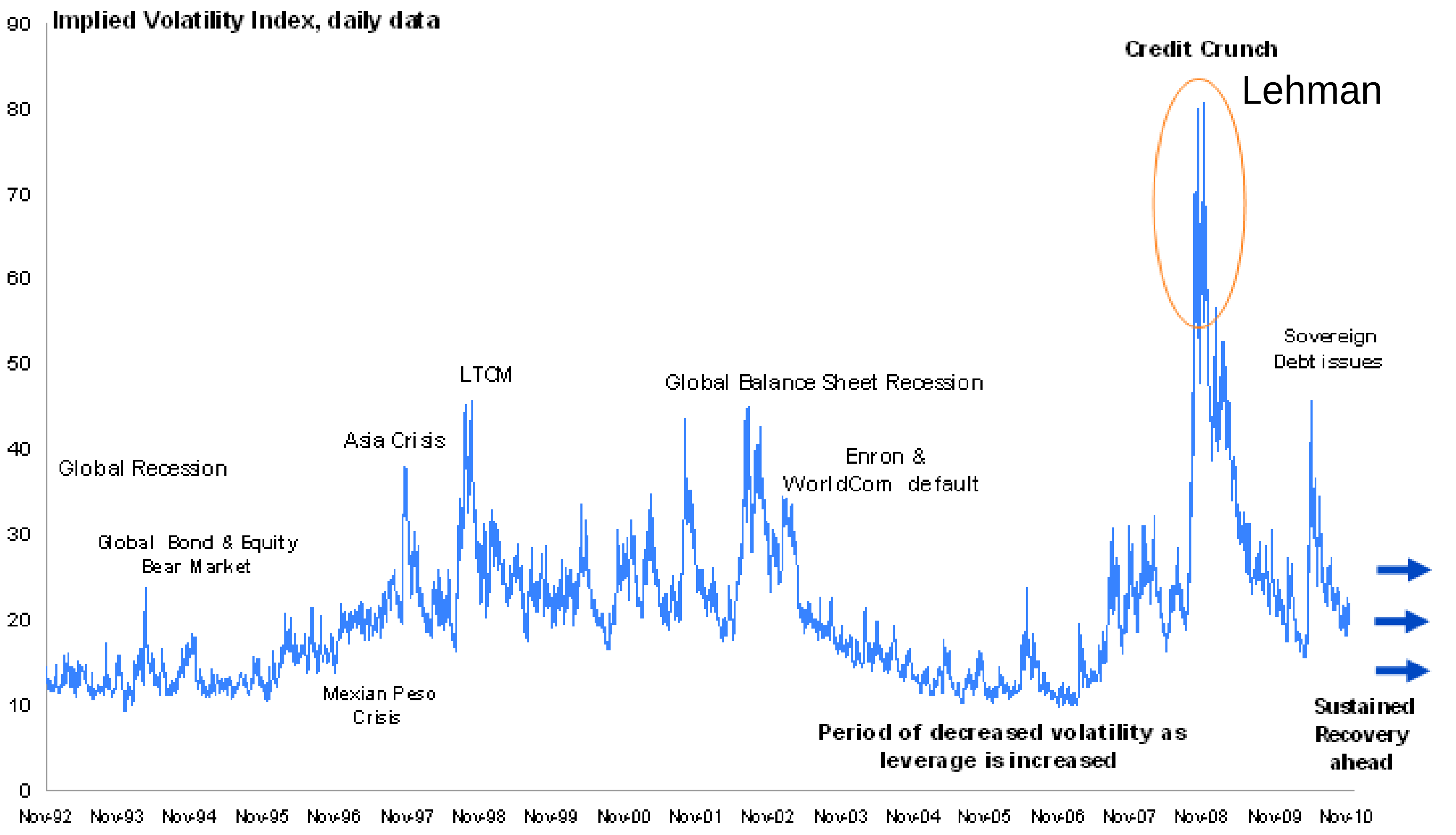
U.S. NATIONAL DEBT CLOCK

The Outstanding Public Debt as of 11 Mar 2011 at 10:52:31 AM GMT is:

$14,188,984,395,158.16

The estimated population of the United States is 310,180,145
so each citizen's share of this debt is $45,744.33.
The National Debt has continued to increase an average of
$4.11 billion per day since September 28, 2007!

The US has been fueling its economic growth with debt. It is now 14 trillion USD and growing. The EIU gives the USA still a stable AA rating. But to me this is a bubble. And if it would burst, it won’t go unnoticed in the supply chains.



This is the Volatility Index from the Chicago Board Options Exchange and is also called the fear index. It might give an indication for new waves

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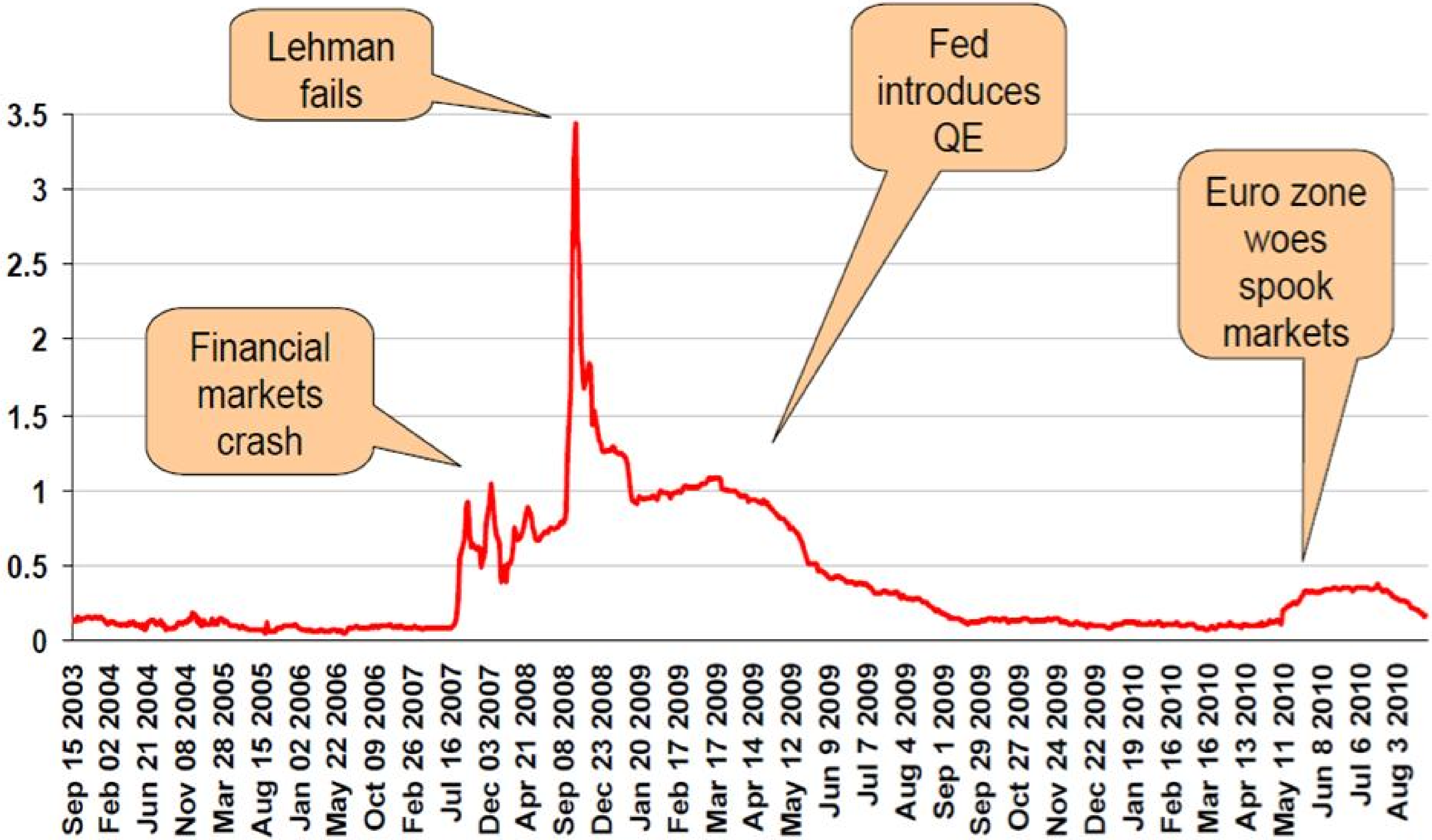

3-month LIBOR/3-month overnight index swap (OIS) spread, percentage points.
A higher spread denotes more market stress. Sources: Haver Analytics; Economist Intelligence Unit.

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Watch the Libor rate!

Stocks: are more important than most economists think

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Stock depth

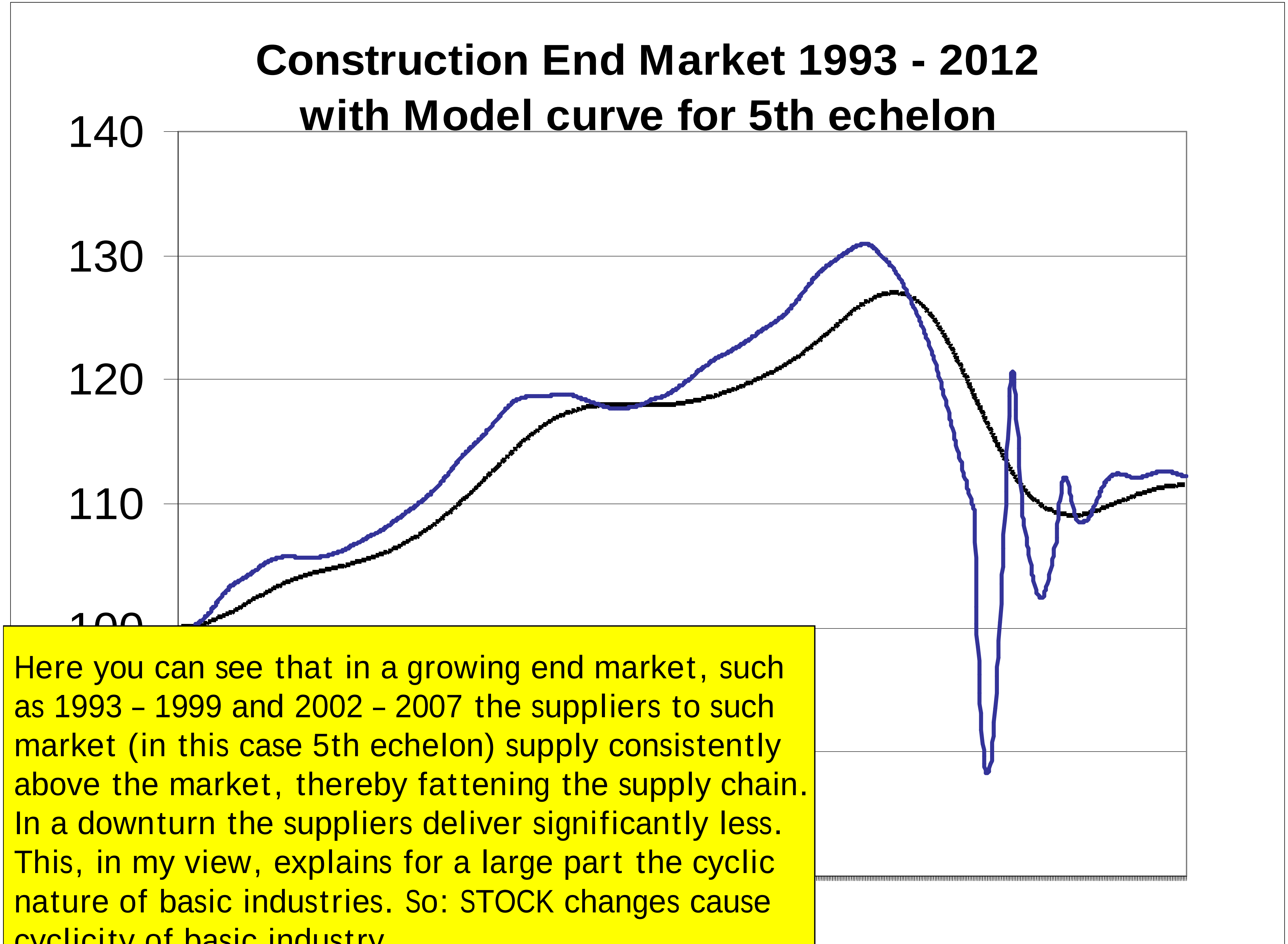
- Most companies have ≥ 2 months stock
- Most Supply Chains contain ≥ 6 steps
- So Stock Depth (SD) > 1 year.

Stocks give a multiplier on <u>changes in growth</u>

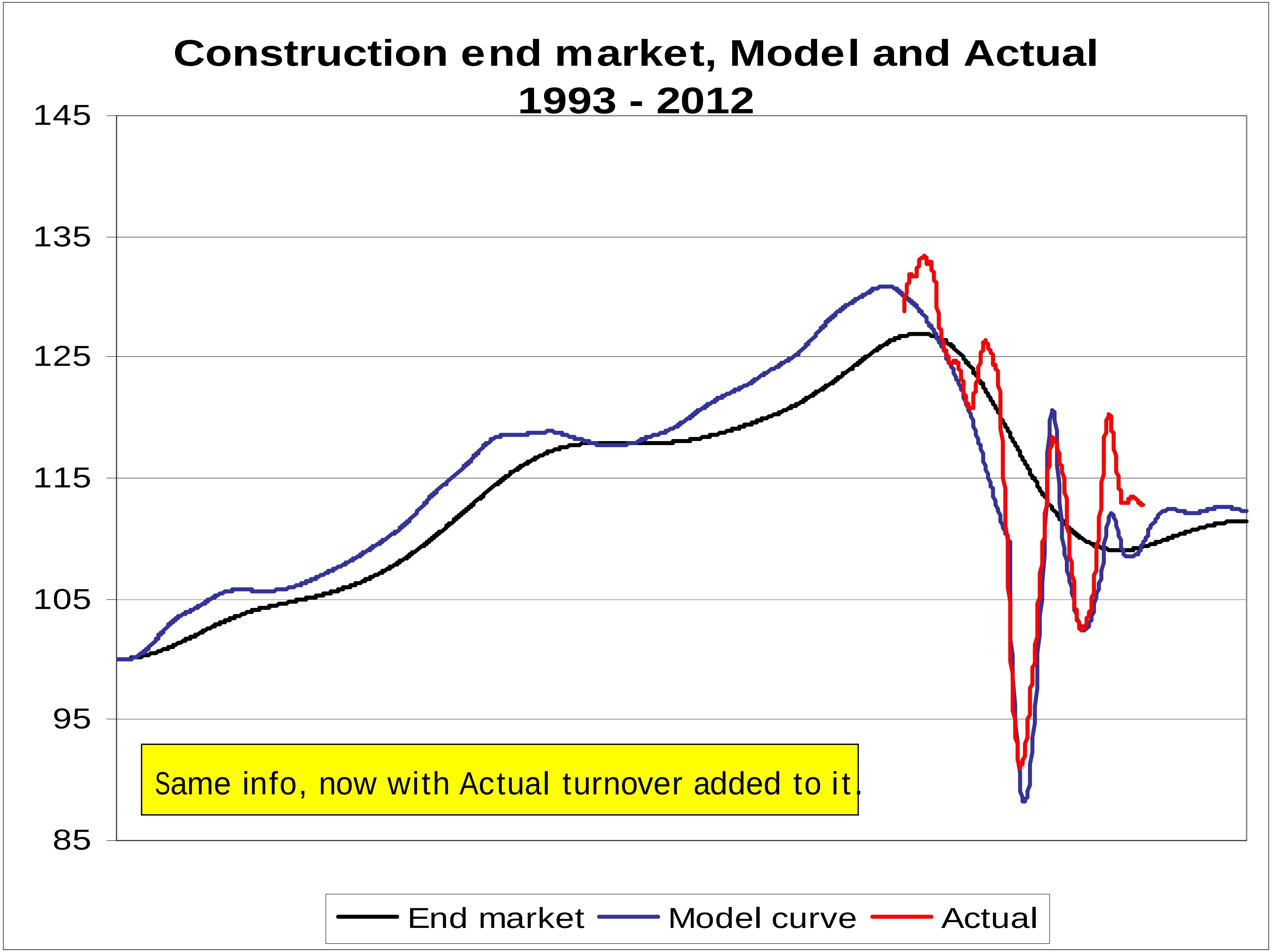
- If growth of the end market changes X% in a period t, the supply chain on average changes (1+ ½ SD/t) * X% during period t

So:

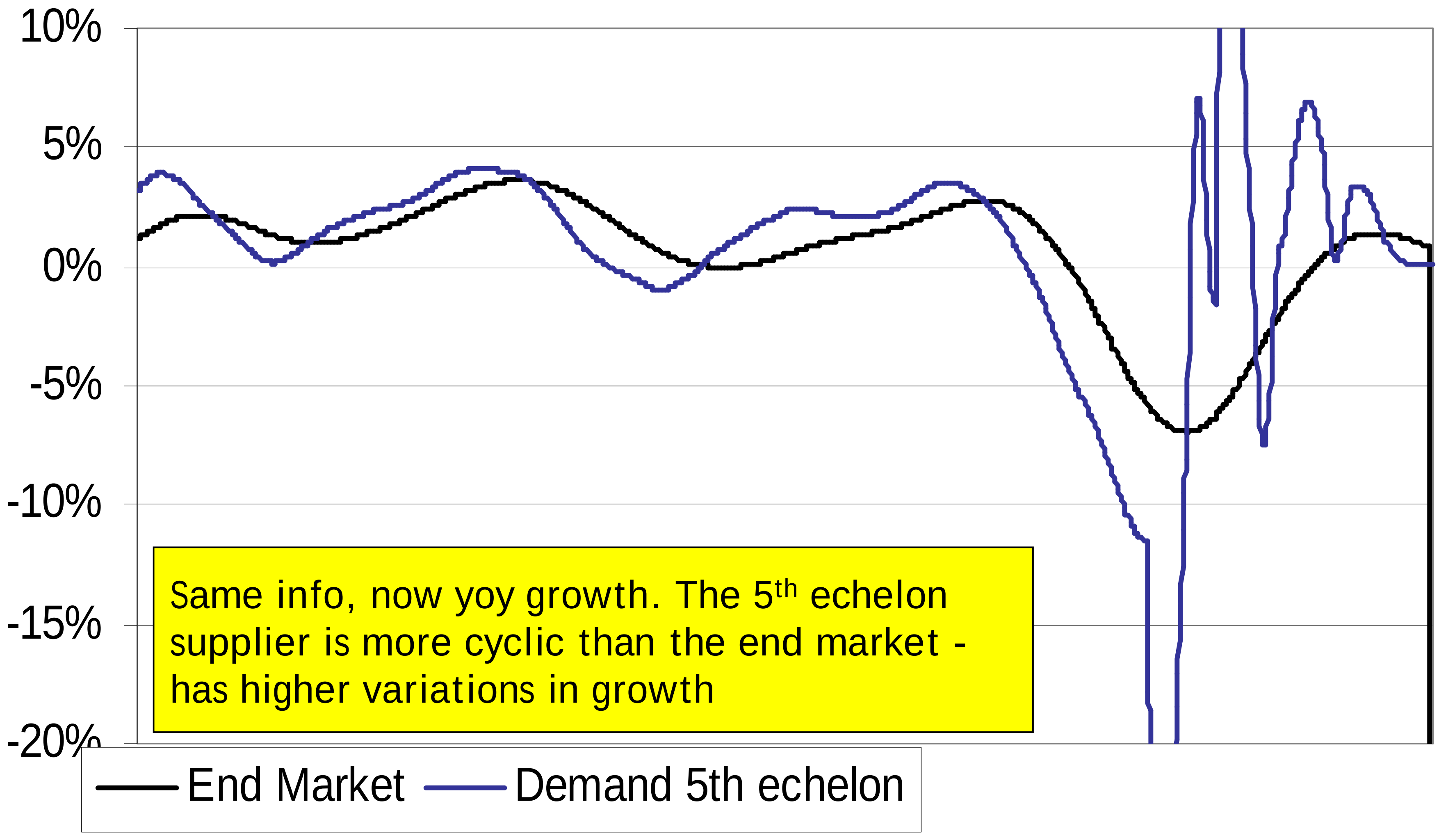
- in a market with stable growth the effects are small
- More variation = more reaction.
- Further away = more reaction.



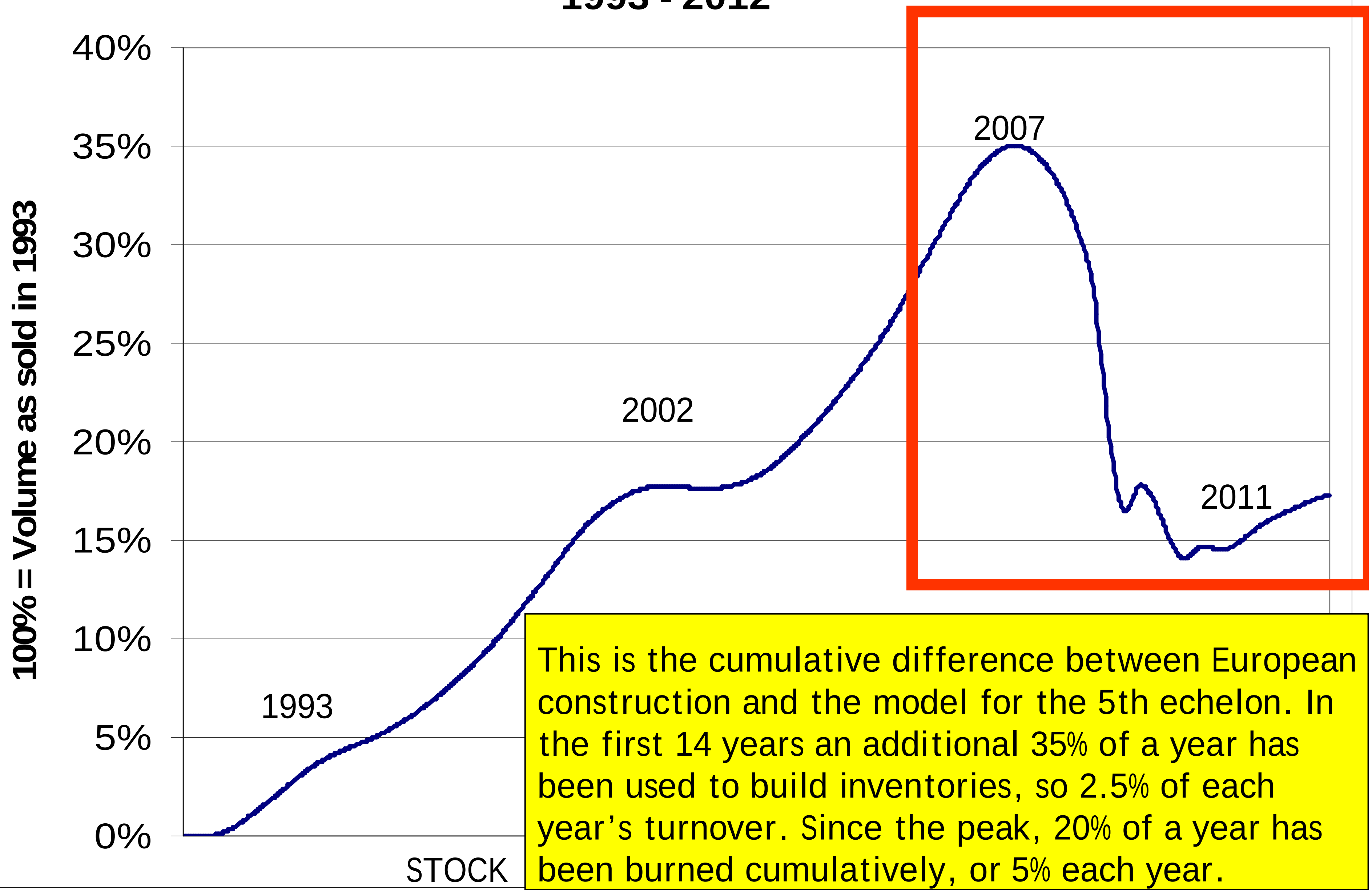
Here you can see that in a growing end market, such as 1993 – 1999 and 2002 – 2007 the suppliers to such market (in this case 5th echelon) supply consistently above the market, thereby fattening the supply chain. In a downturn the suppliers deliver significantly less. This, in my view, explains for a large part the cyclic nature of basic industries. So: STOCK changes cause cyclicity of basic industry.


Construction end market, Model and Actual
1993 - 2012
145
135
125
115
105
95
85
Same info, now with Actual turnover added to it.
End market
Model curve
Actual

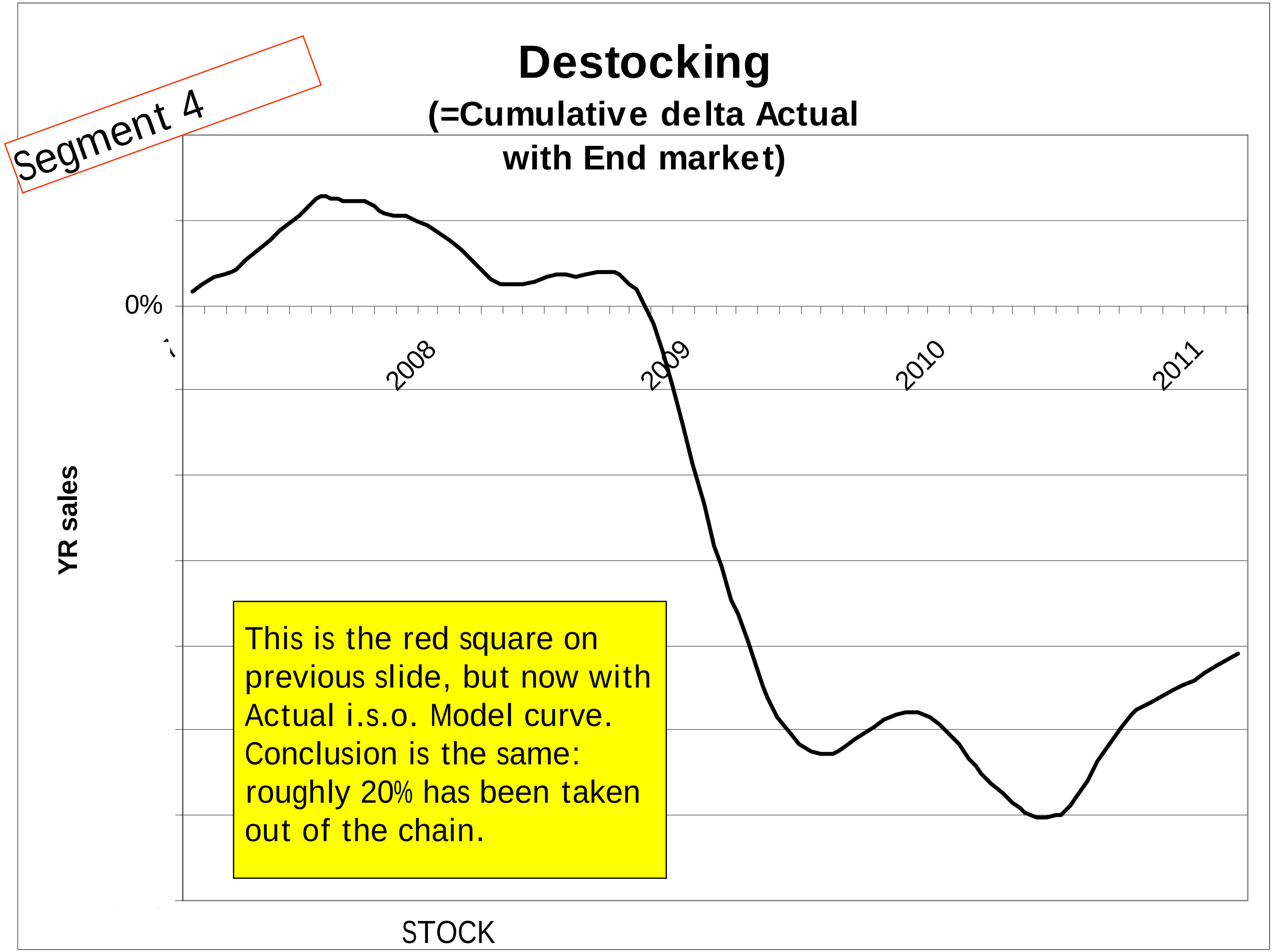
Construction 1993 - 2012
Growth Yoy



Cumulative stock building
European construction industry
1993 - 2012



This is the cumulative difference between European construction and the model for the 5th echelon. In the first 14 years an additional 35% of a year has been used to build inventories, so 2.5% of each year’s turnover. Since the peak, 20% of a year has been burned cumulatively, or 5% each year.


Segment 4
Destocking
(=Cumulative delta Actual
with End market)
0%
2008
2009
2010
2011
YR sales
This is the red square on previous slide, but now with Actual i.s.o. Model curve. Conclusion is the same: roughly 20% has been taken out of the chain.
STOCK

Conclusions

Supply Chains shake the world economy
End Markets determine most of your sales
Modeling can distinguish between end market, stock changes and market share.

Macro Economics should include Lehman Waves.
Lehman Waves, once started, can be predicted

And I believe so strongly in this that I have decided to leave DSM after 23 years and start my own company:

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flostock

stock & flow analyses

www.lehmanwave.com
www.flostock.nl

Thank you

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