flostock

stock & flow analyses

DSM

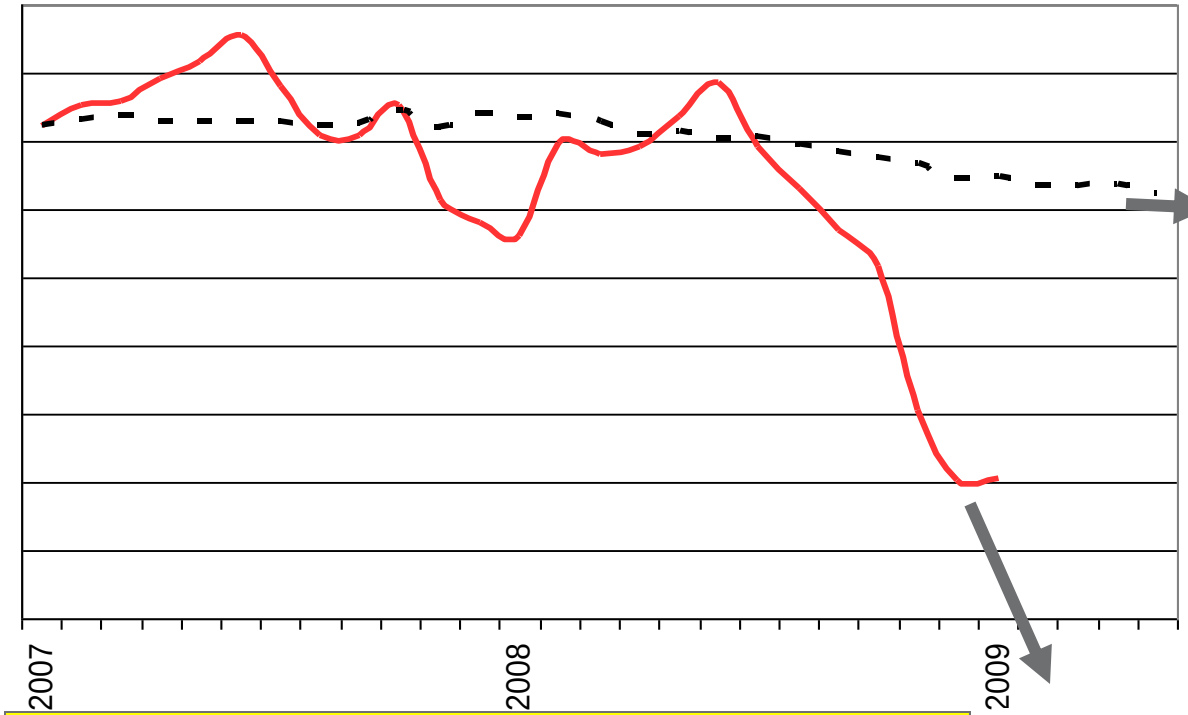
BRIGHT SCIENCE. BRIGHTER LIVING.

Analyzing, modeling and predicting volatility in the long coil supply chains

Robert Peels, Flostock

VOLATILE TIMES

Observations in 2008



Retail
GDP
Construction

Many producers in the industry saw demand for their products decline sharply in Q4 2008.
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.

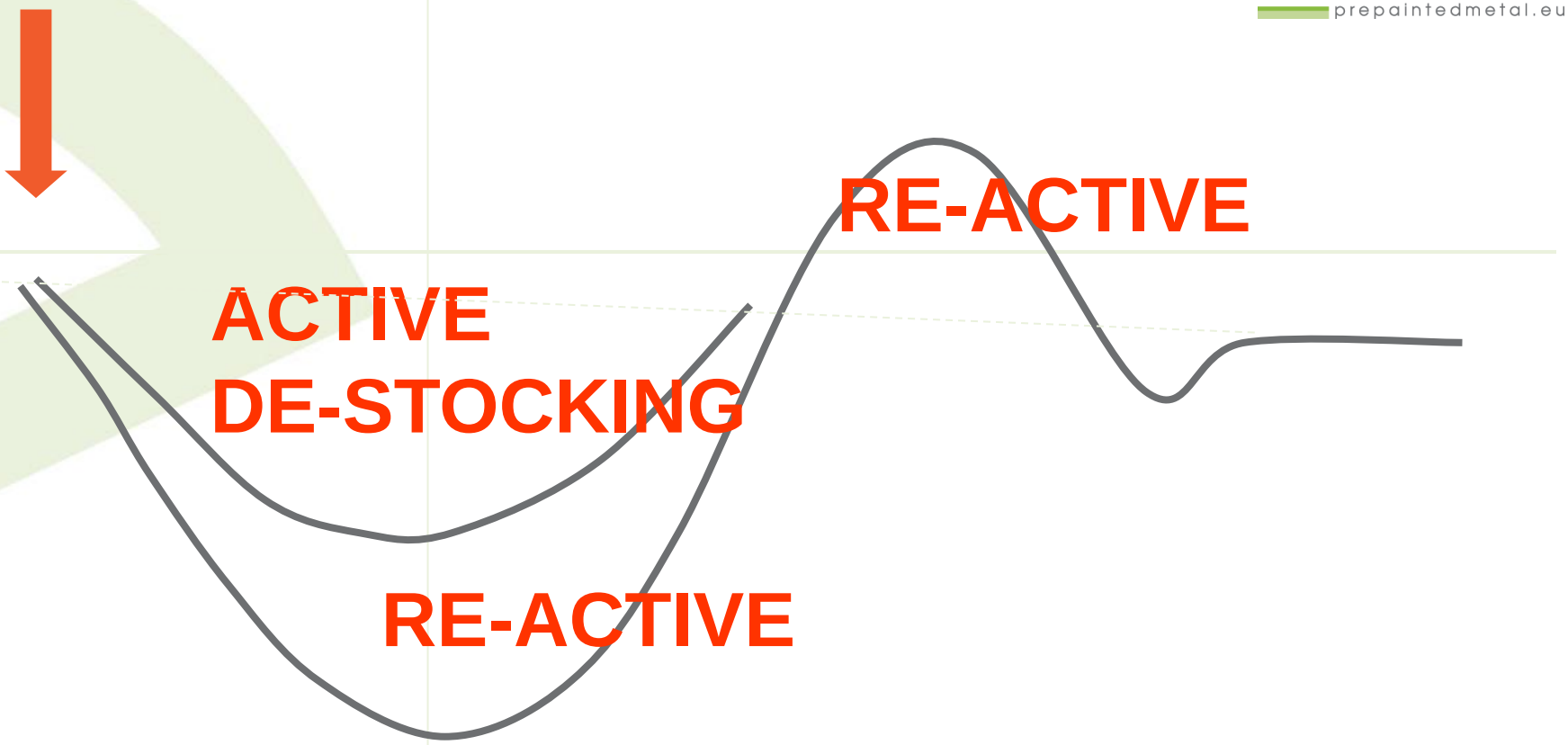
Sales
Banks
Cars,
Stock markets
Consumer confidence
Commodity prices

By combining that info with a DSM letter about reducing working capital and with a vague idea about the long length of the supply chains (complaint from a profiler about a batch shipped a year back), Robert Peels drafted the following hypothesis in December 2008:

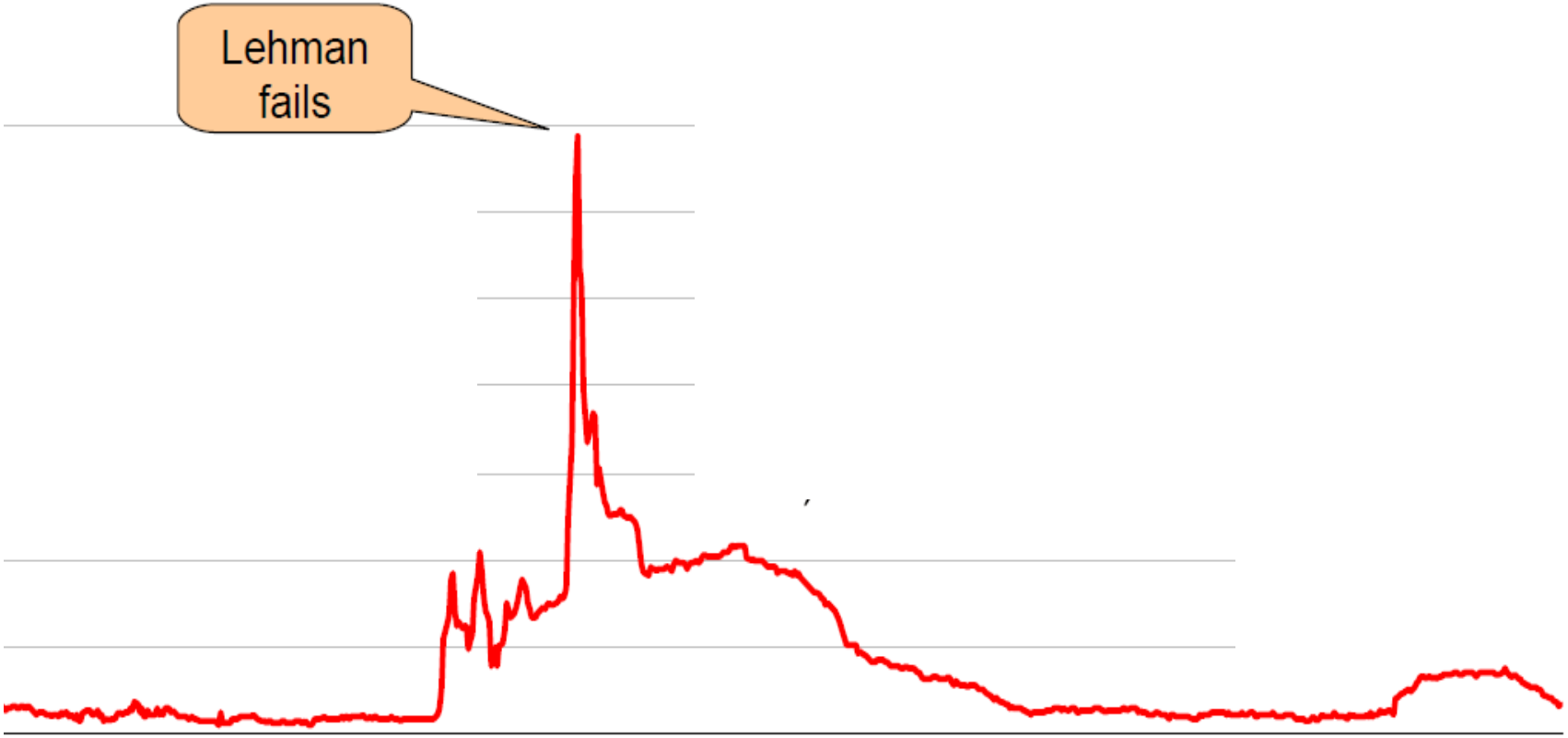
The bankruptcy of Lehman Brothers in September 2008 triggered global de-stocking, which resulted in a very strong decline of sales for upstream companies

ANNP
BASF
Becker
Corus Color
Euramax
HCI
Jack Muller
MCB
Philips
SAB Profiel
SSAB
Tata/Corus
ThyssenKrupp
Volkswagen

There was no published info available early 2009. But DSM as member of the ECCA had connections to a great number of companies in the chain. So phone interviews were held with the companies mentioned here (thank you!), and with another 40 companies, split over all the value chains of DSM Coating Resins.



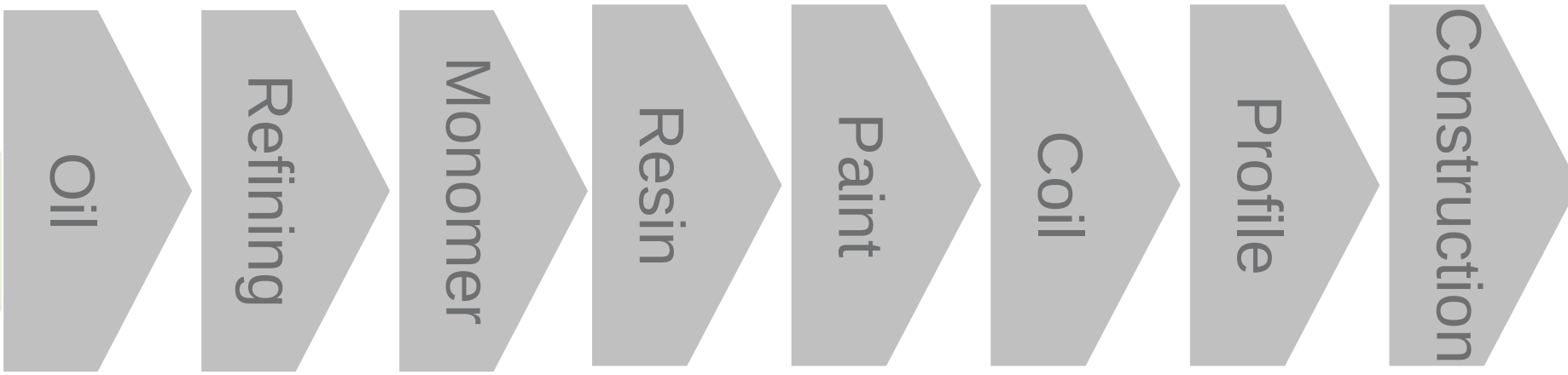
Based on telephone interviews and market research this picture could be drawn. Active de-stocking is a reduction of the stock/sales ratio, based on a CFO decision. Re-active de-stocking is the automatic response by a company if sales goes down. Once Active de-stocking has been implemented, sales levels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



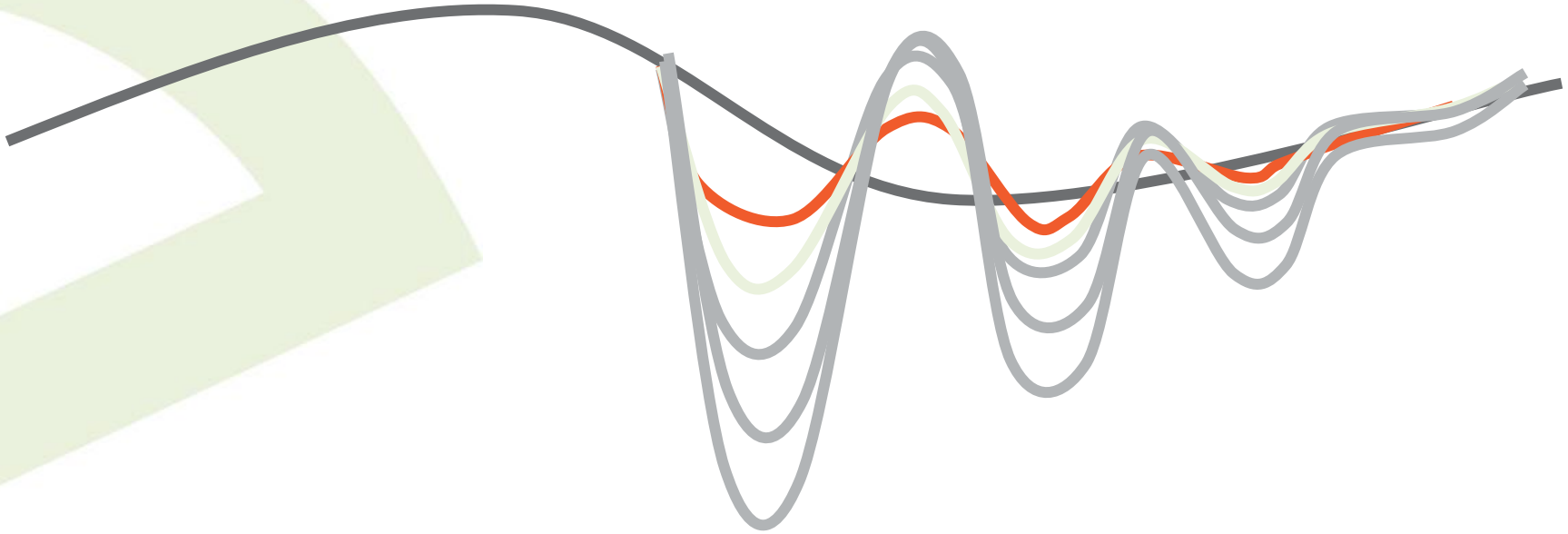
Libor interest rate 2003 - 2010

Later we found that the Libor interbank interest rate peaked directly after Lehman failed, causing credit to disappear completely, globally

flostock
stock & flow analyses

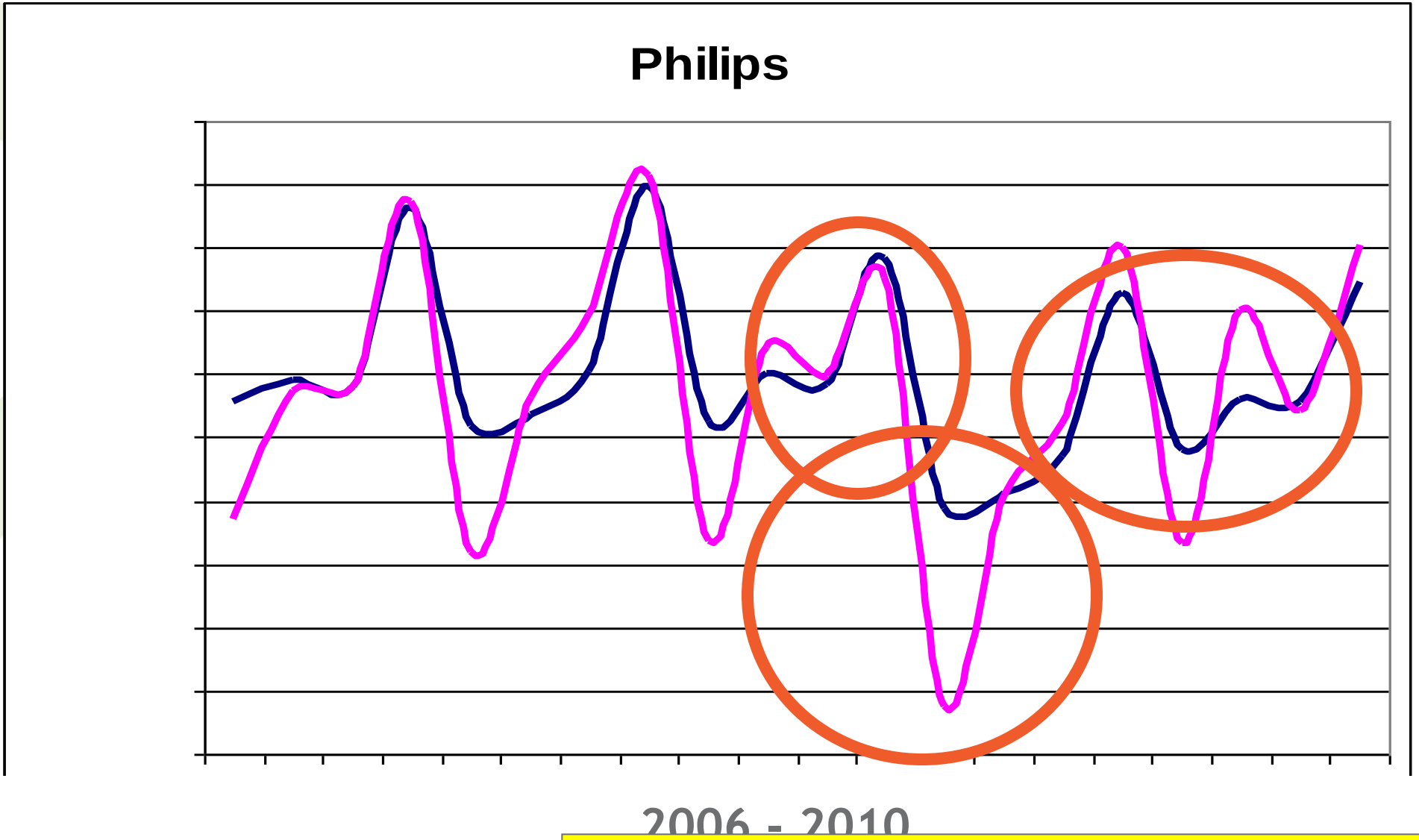


This is a simplified version of the long supply chain for Coil.

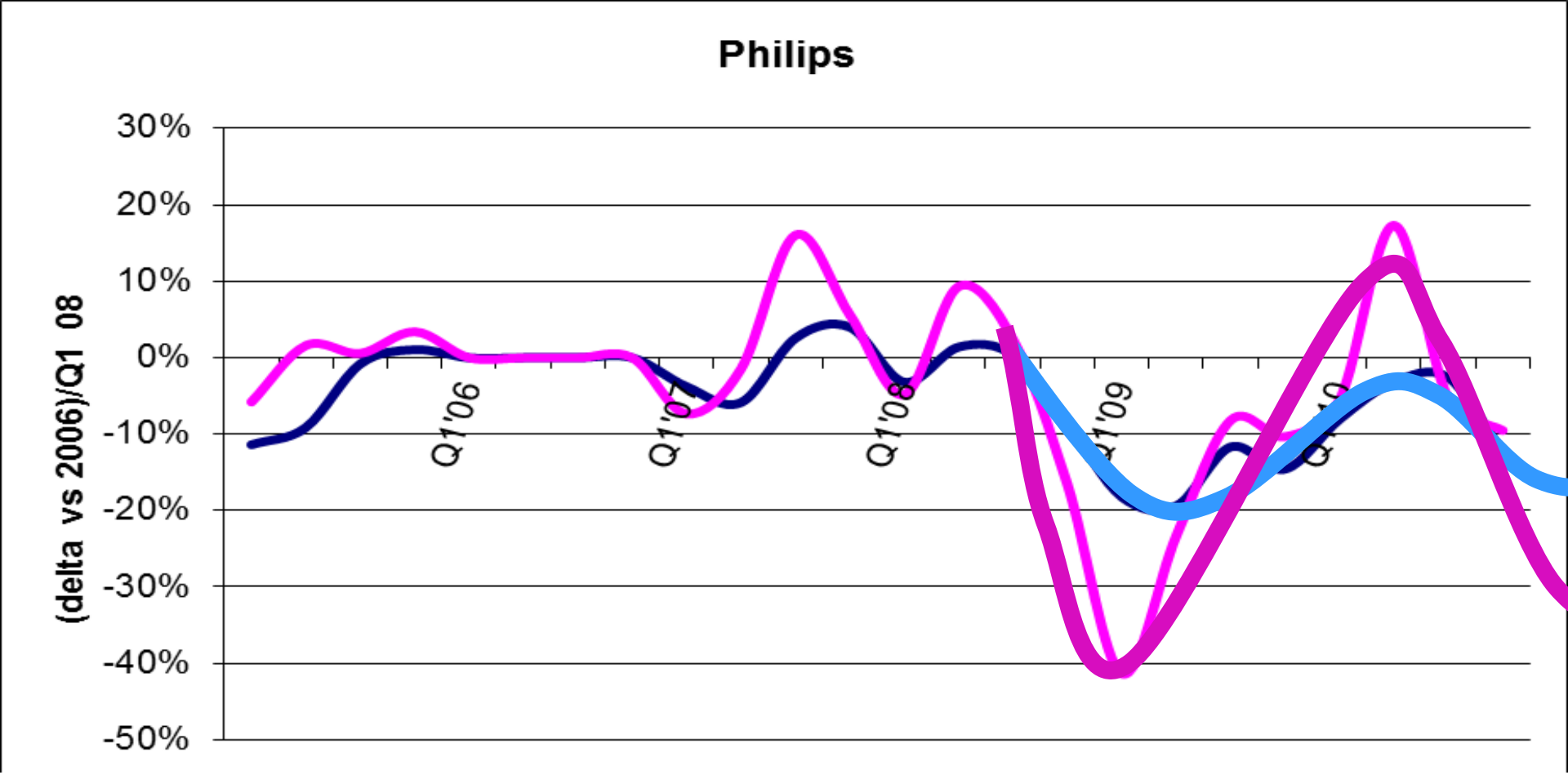


The “Lehman Wave”

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. Because it is a wave and it was triggered by Lehman, we called it the Lehman Wave.



This example is taken from the Q-reports of Philips. When the crisis started Philips experienced 1 week de-stocking by its retailers but also actively de-stocked itself. Later it reactively re-stocked.



2006 - 2010

Sell

Buy

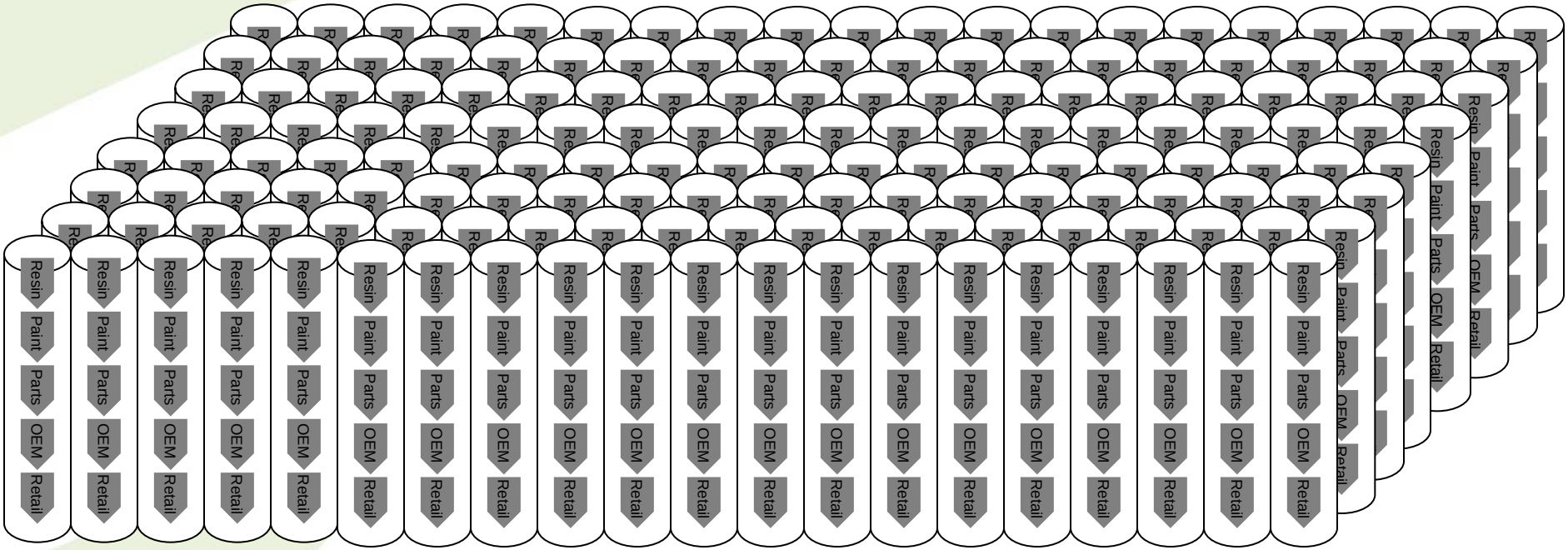
Philips started its own Lehman Wave.

12

flostock
stock & flow analyses

Resin → Paint → Parts → OEM → Retail

ecca
prepaintedmetal.eu

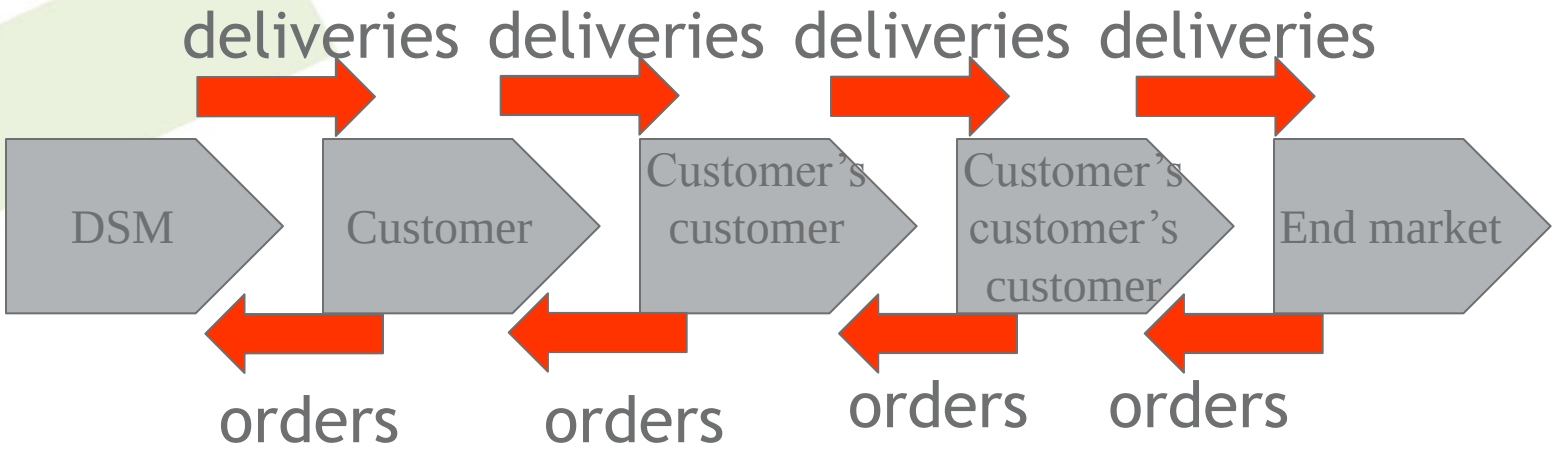


flostock
stock & flow analyses

The idea was borne to use a “Beer game” for predicting the cause of the Lehman Wave. Professor Jan Fransoo of Eindhoven University of Technology proposed to use System Dynamics software and Maxi Udenio built the first model.

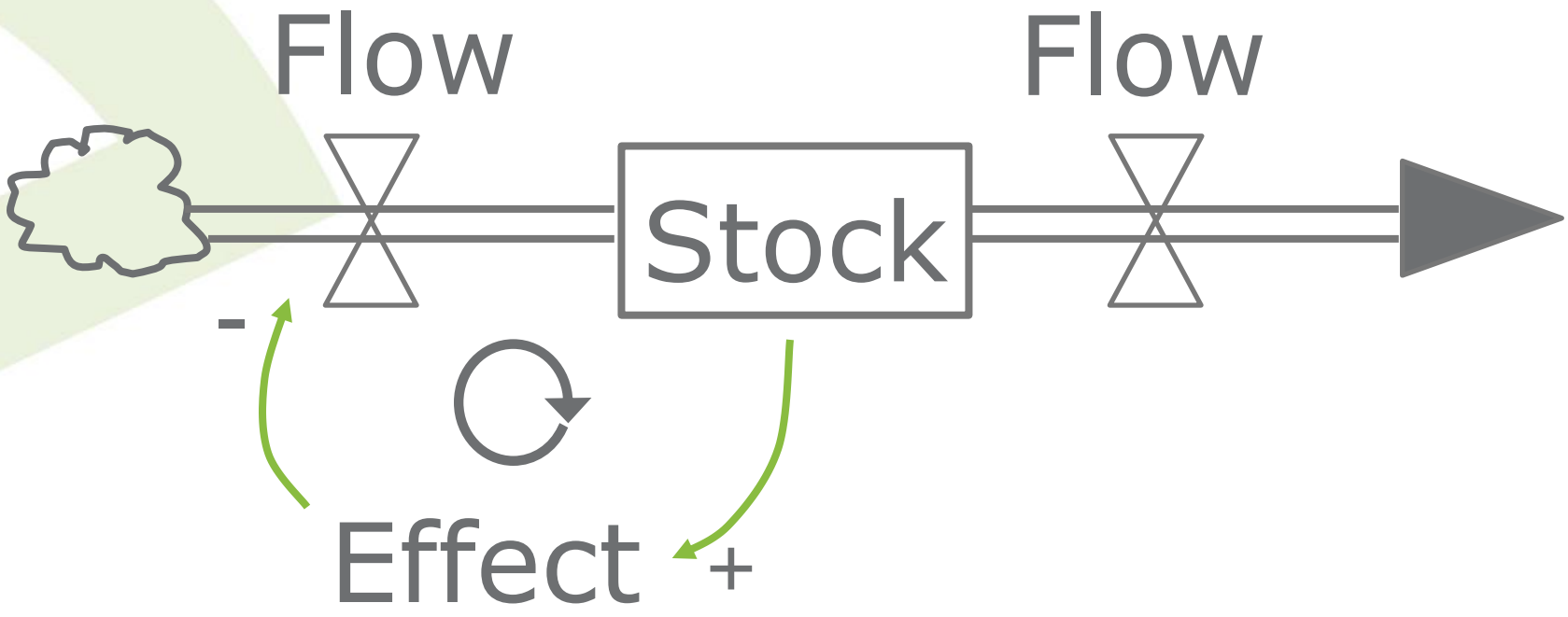
MODELING

Supply Chain / Value Chain



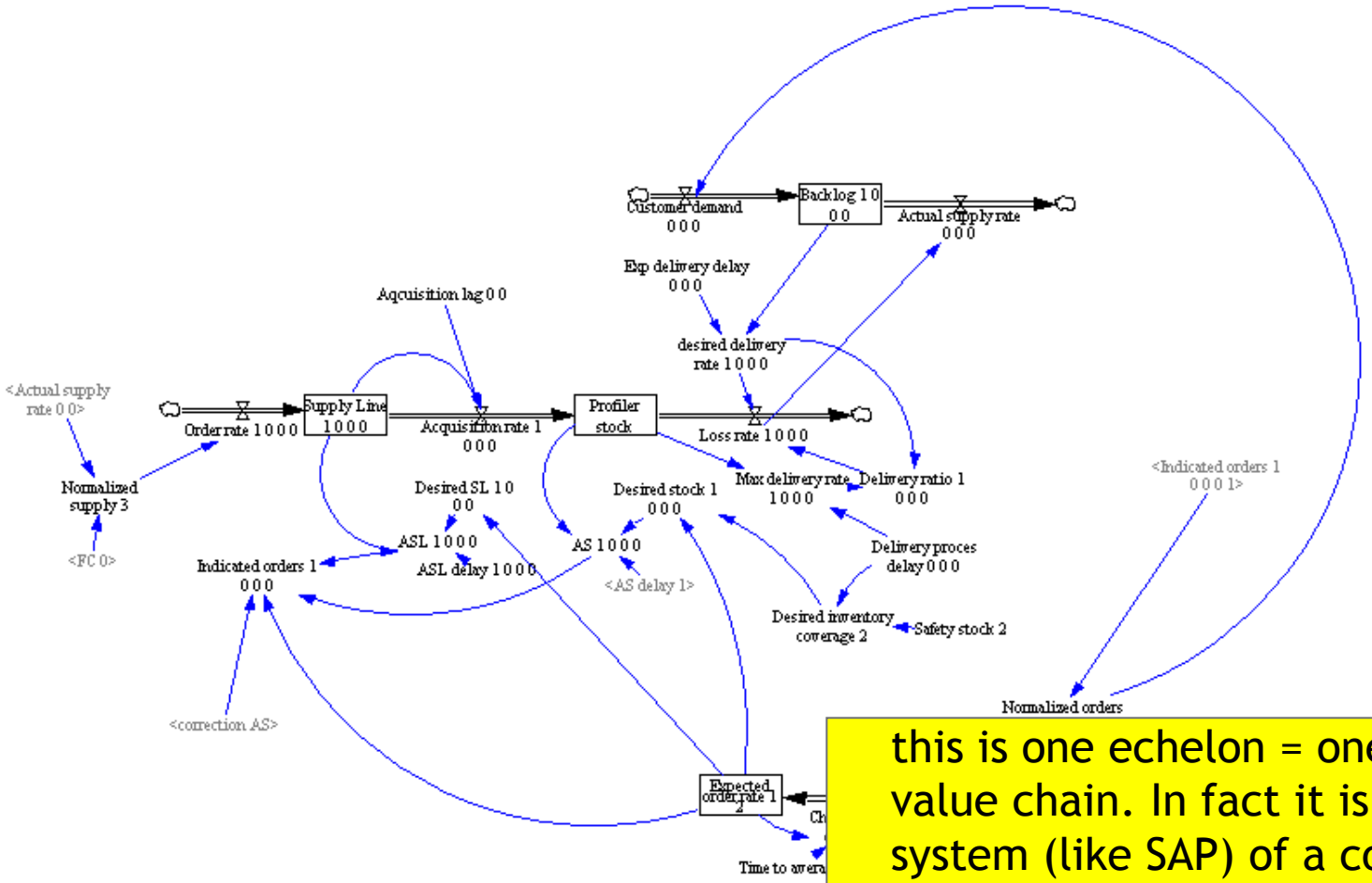
Most mental models are linear, do not include feedback loops and do not include a "stock & flow" interaction.

System Dynamics



System Dynamics thinking works with stocks and flows, and the feedback loops between them.

One of the echelons in value chain

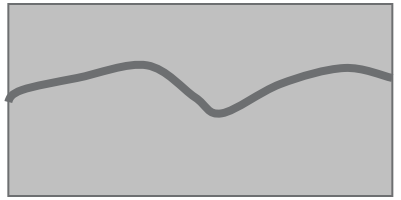


this is one echelon = one step in the value chain. In fact it is the ERP system (like SAP) of a company. Orders come in, there is planning, there is desired stock coverage, there is actual stock, actual stock coverage, there are orders to the supplier, etc etc. Everything is interactive.

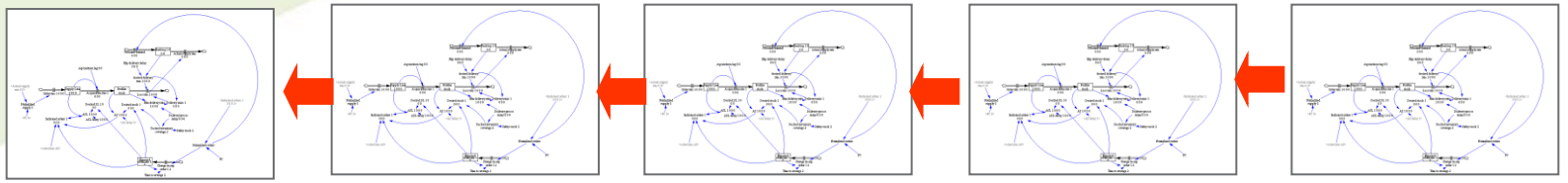
Technische Universiteit **Eindhoven** University of Technology

Dynamic modeling

End market demand

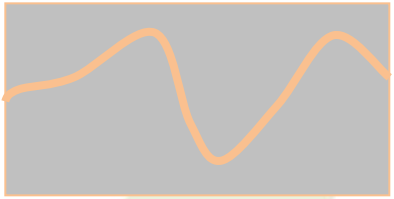


IN



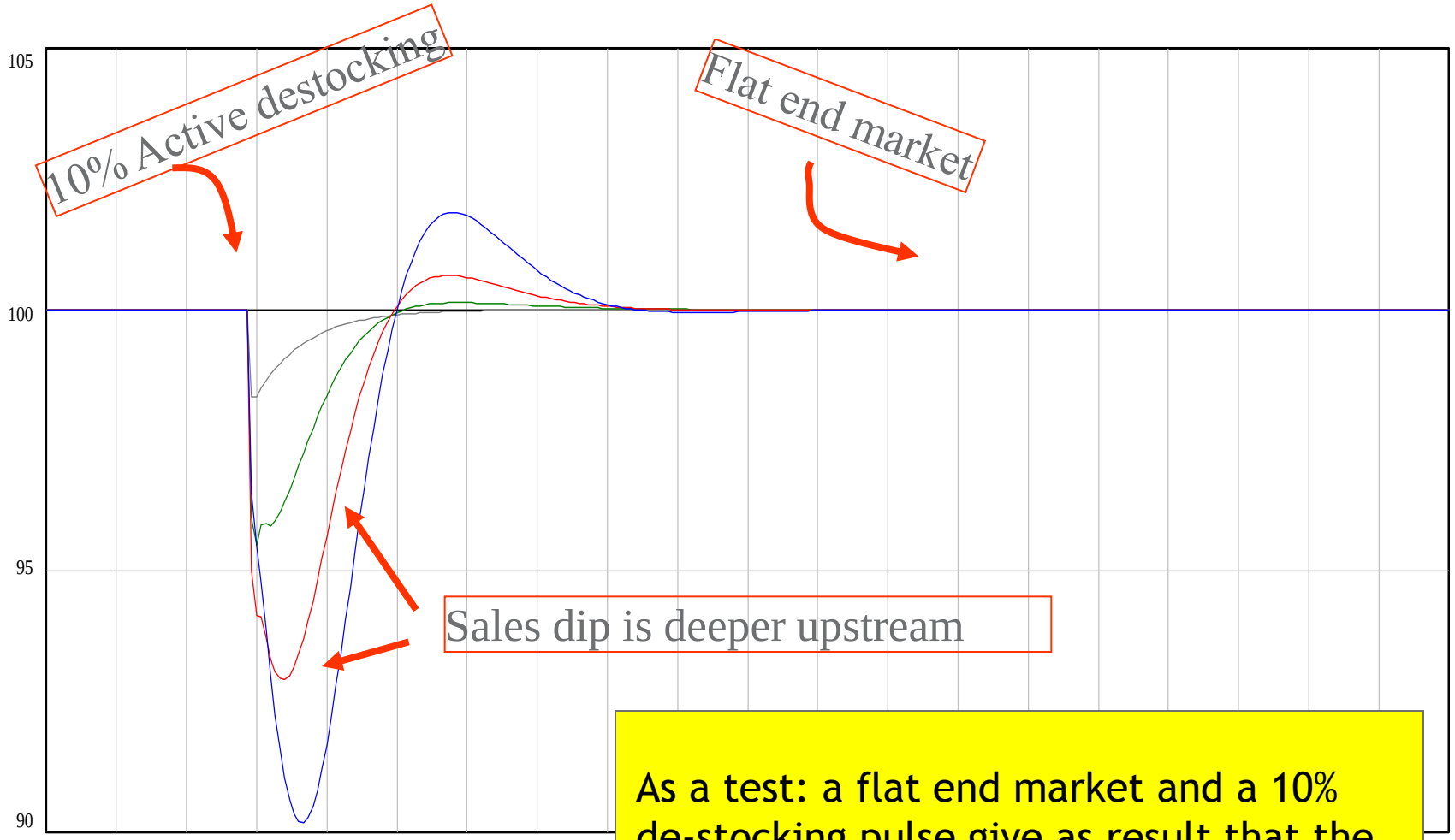
OUT

Resin Paint Coil Profiler Construction

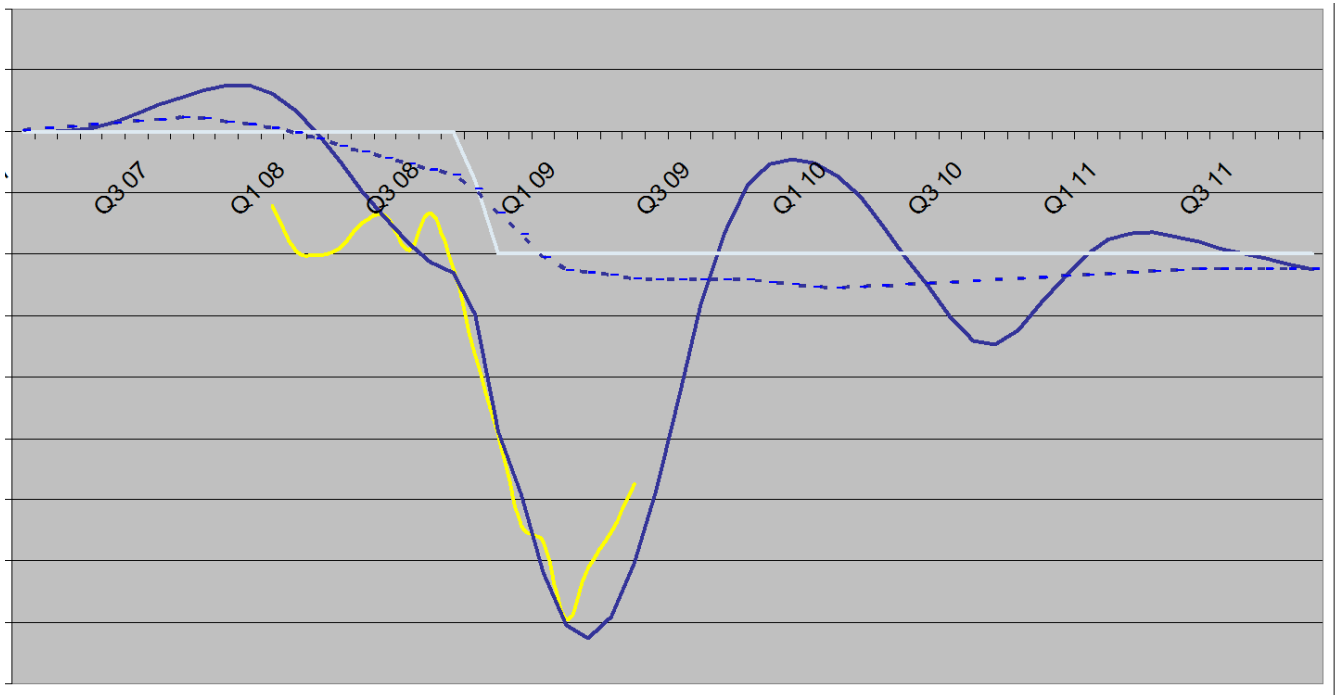


Upstream demand

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.

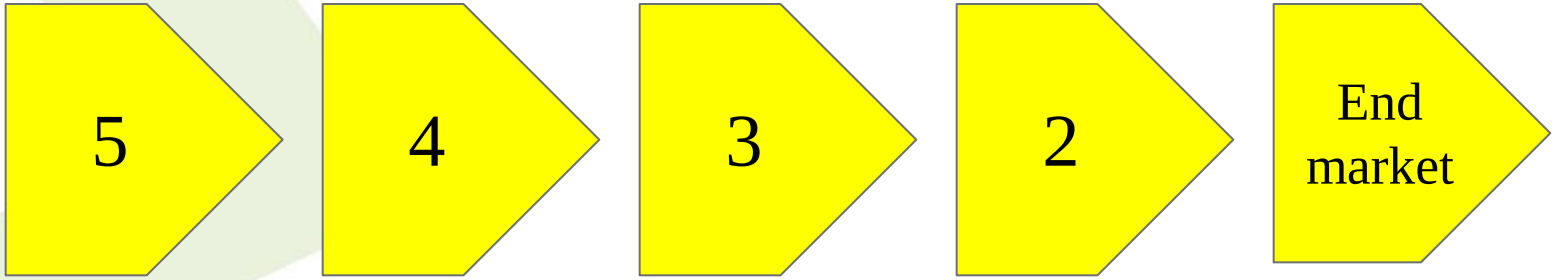


As a test: a flat end market and a 10% de-stocking pulse give as result that the sales dip is deeper upstream.



The blue line is the first graph ever made here. In January 2009 it predicted the timing and amplitude of the first and second dip and peak for Coil largely correct.

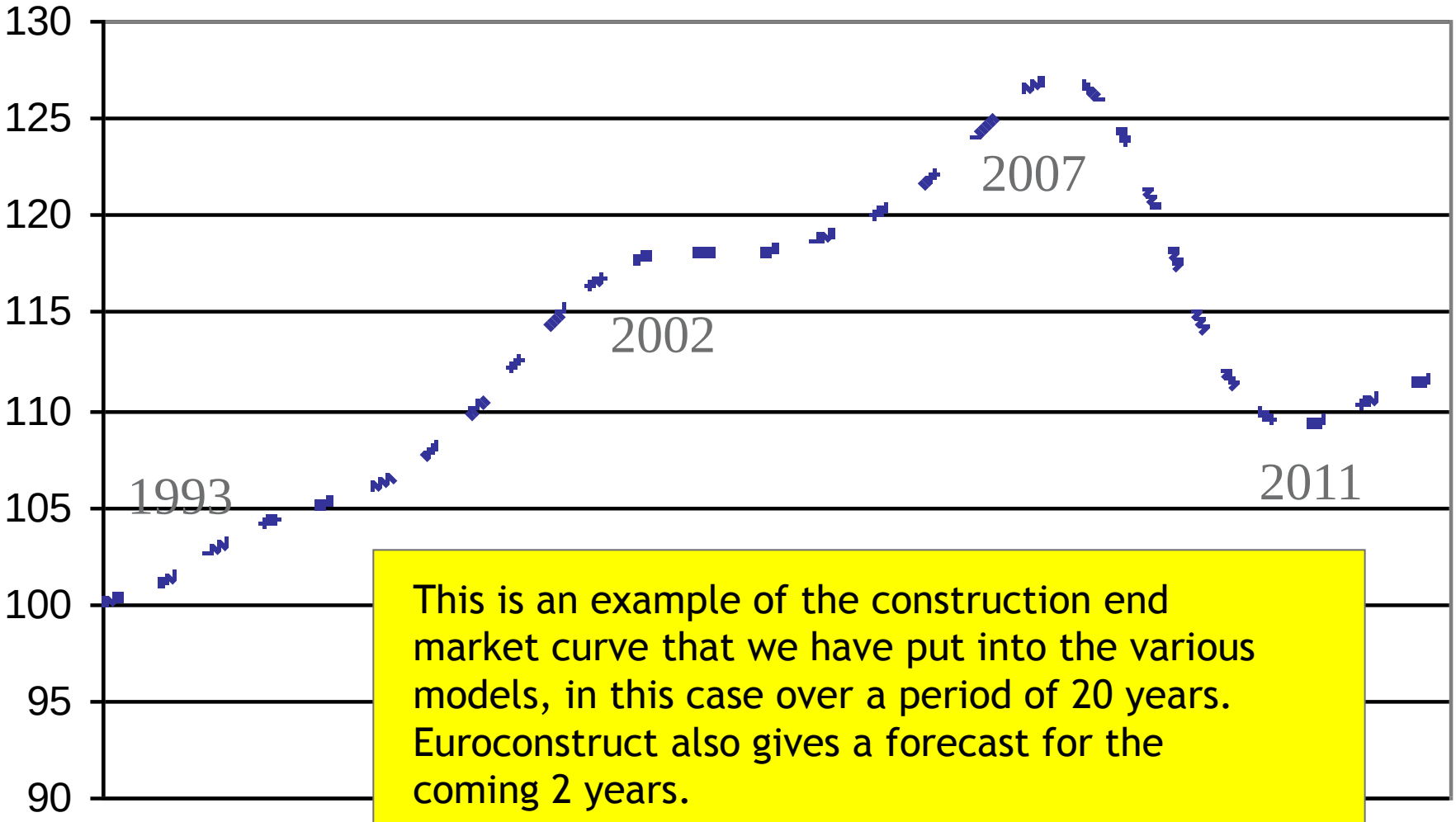
Micro / Macro



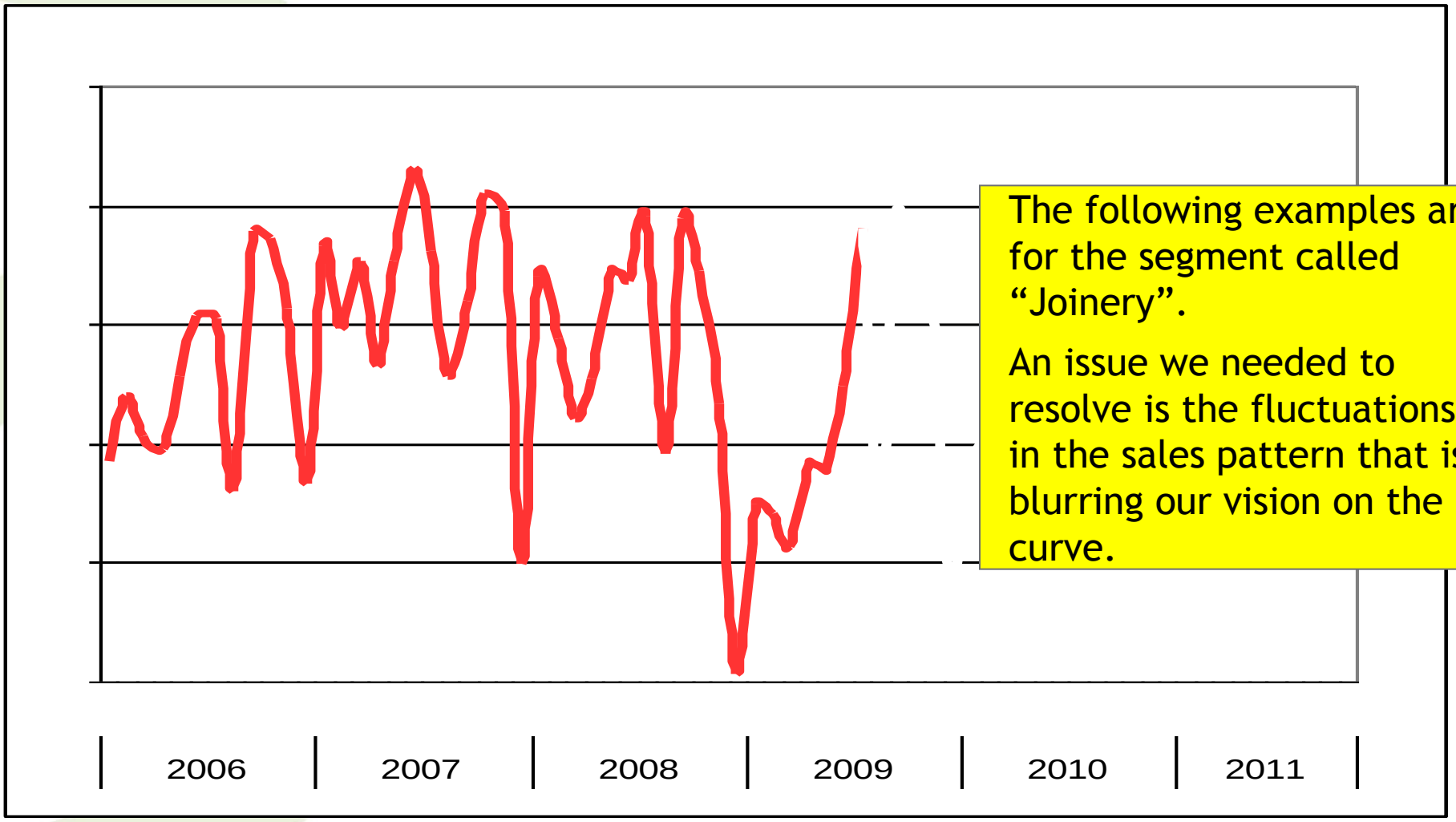
150 x 150 x 150 x 150 = 505 million

There was resistance from many economists, who argue that micro and macro cannot be connected. This project has shown that the supply chain indeed is the connection between micro and macro. If each company in the chain has > 55 customers, the total number of end customers is higher than the population of the EU.

Construction End market
1993 - 2012

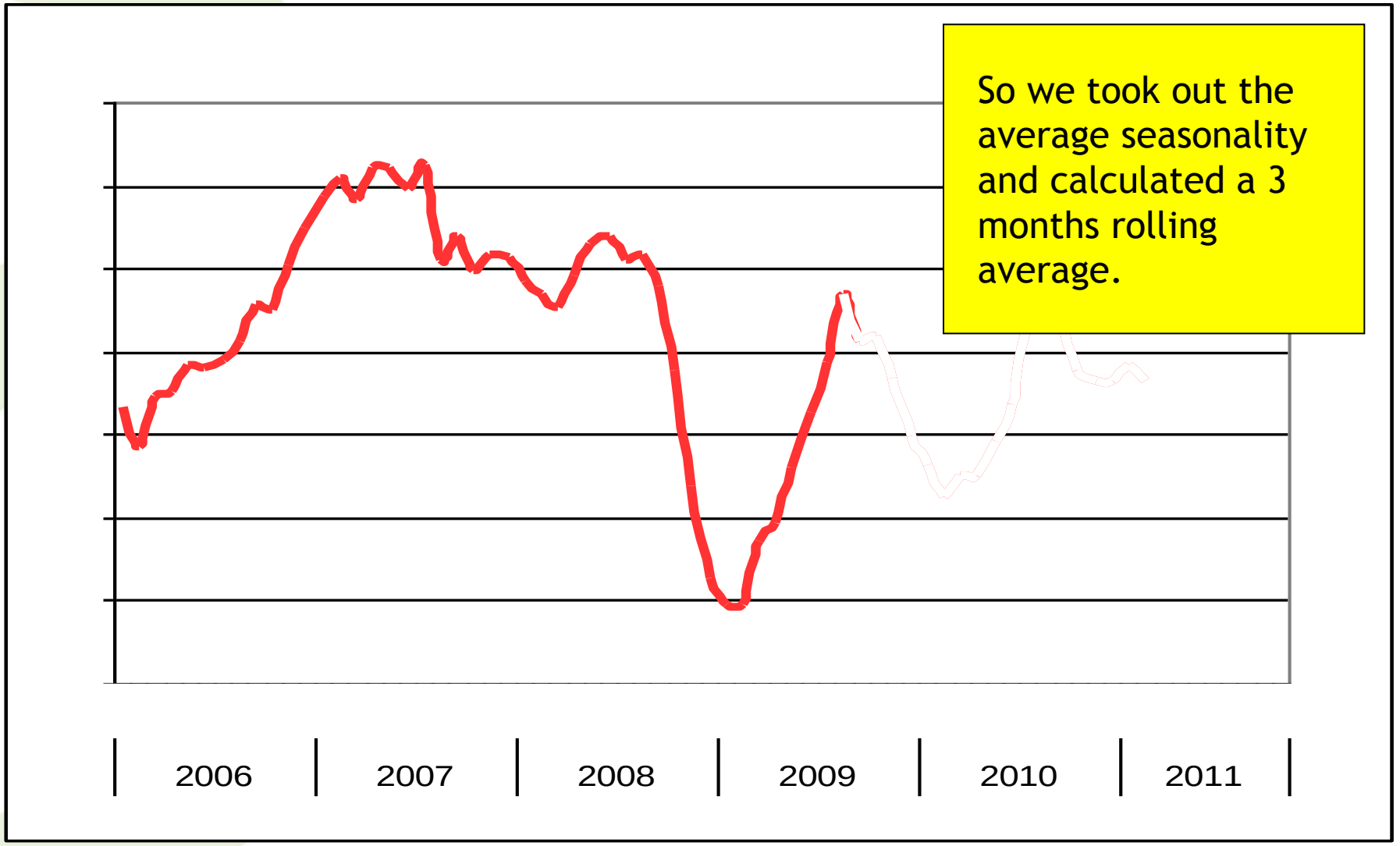


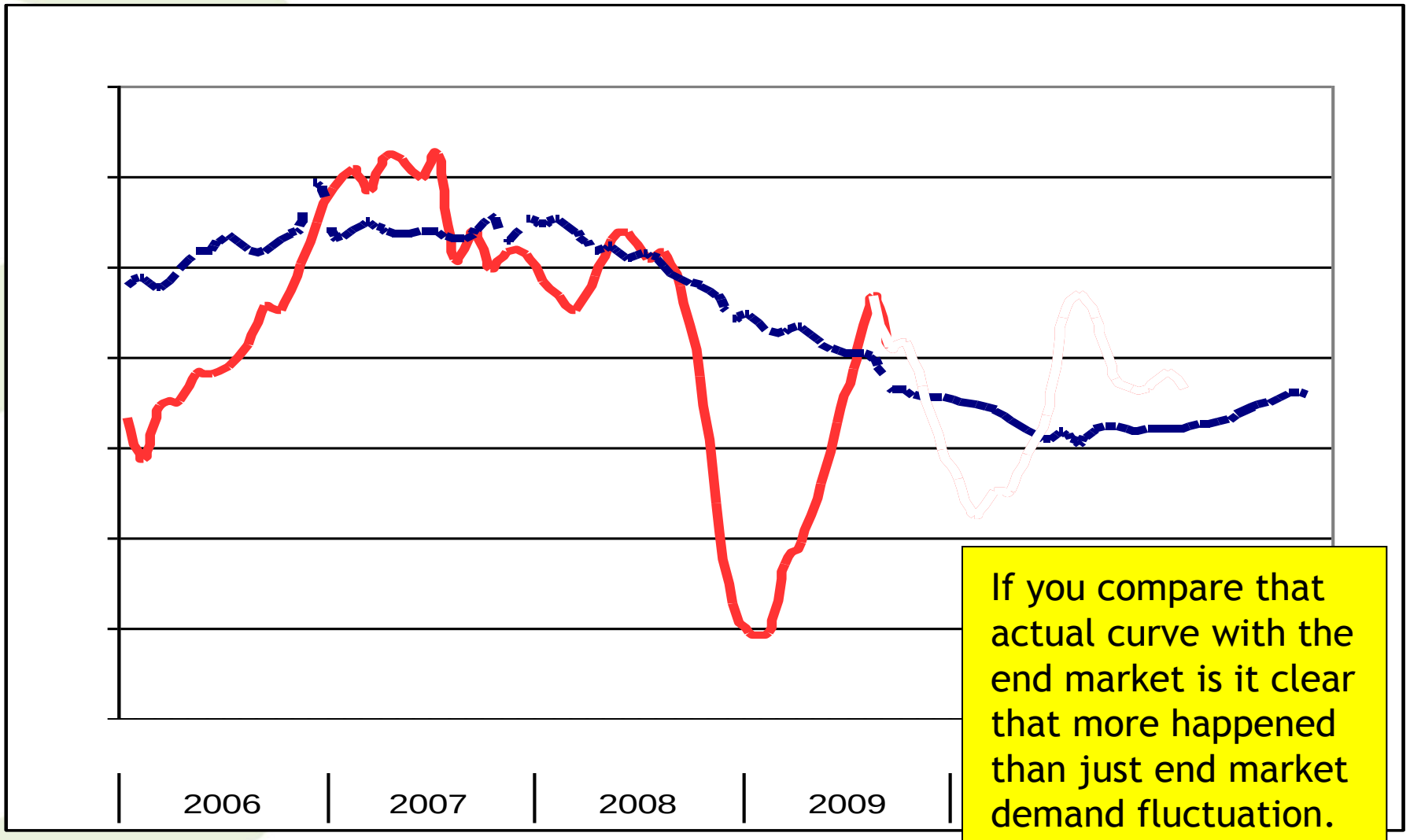
This is an example of the construction end market curve that we have put into the various models, in this case over a period of 20 years. Euroconstruct also gives a forecast for the coming 2 years.



The following examples are for the segment called “Joinery”.

An issue we needed to resolve is the fluctuations in the sales pattern that is blurring our vision on the curve.

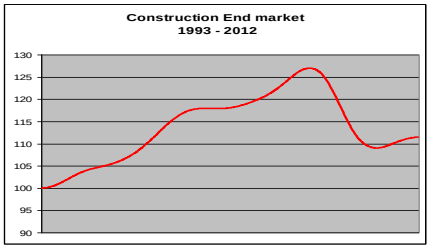

So we took out the average seasonality and calculated a 3 months rolling average.
2006
2007
2008
2009
2010
2011



If you compare that actual curve with the end market is it clear that more happened than just end market demand fluctuation.

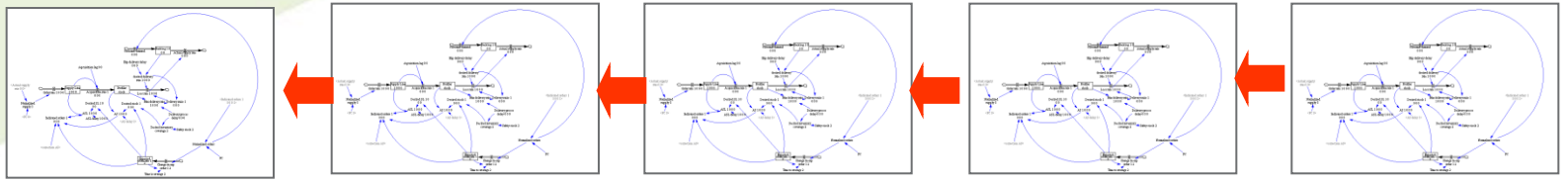
Dynamic modeling

End market demand



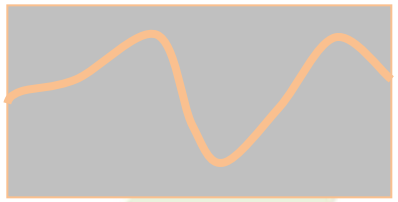
IN

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



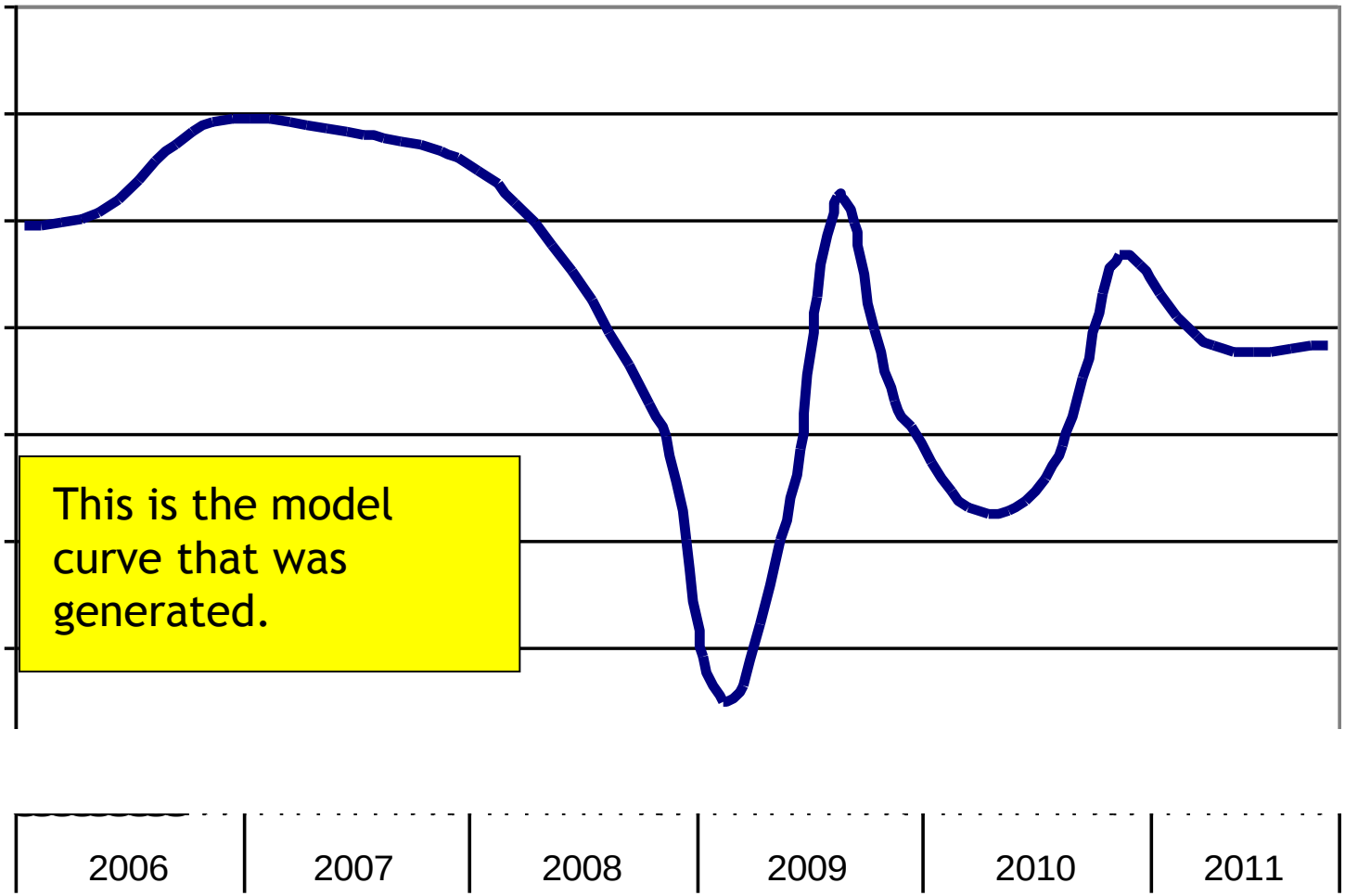
OUT

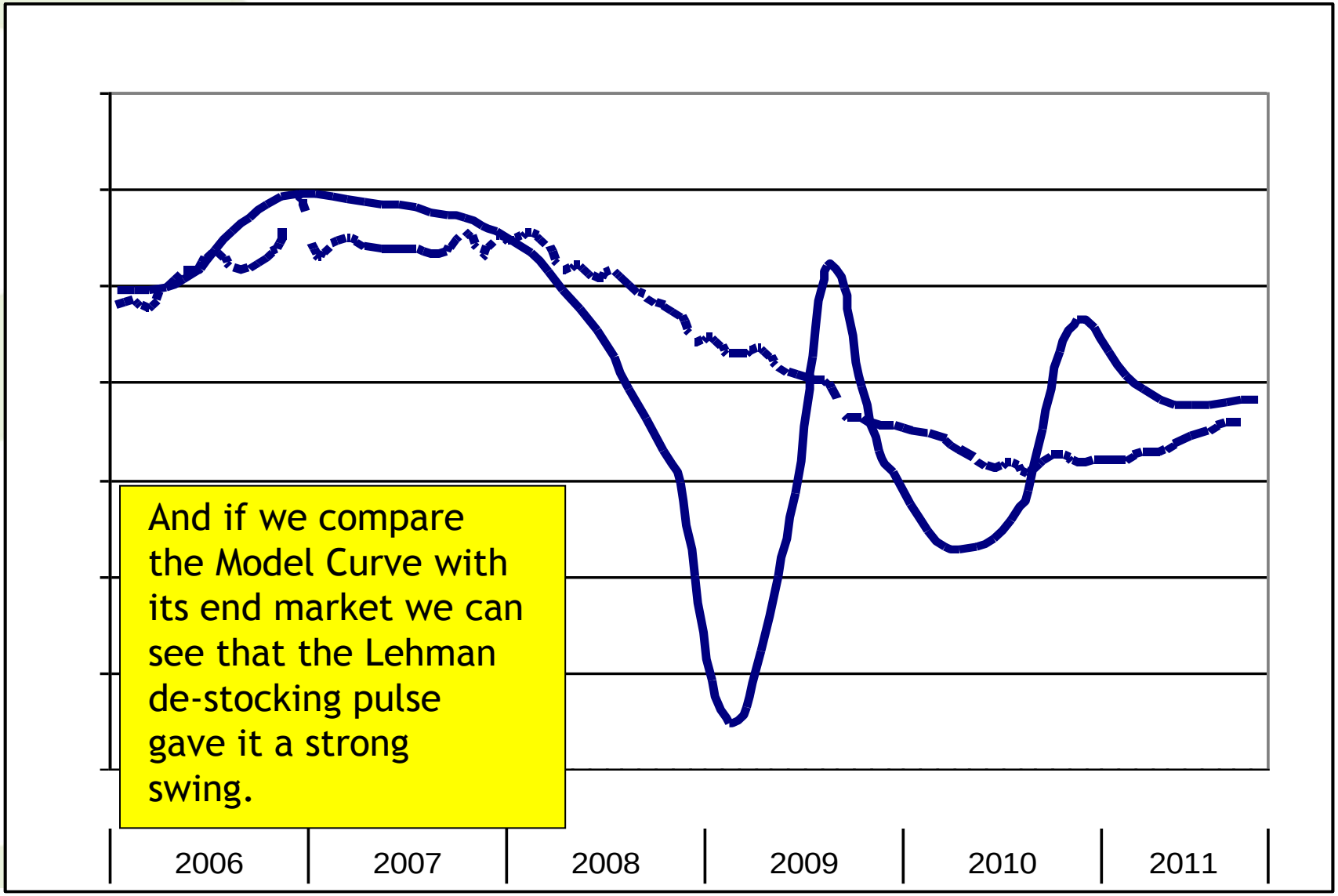
Resin Paint Parts OEM Retail

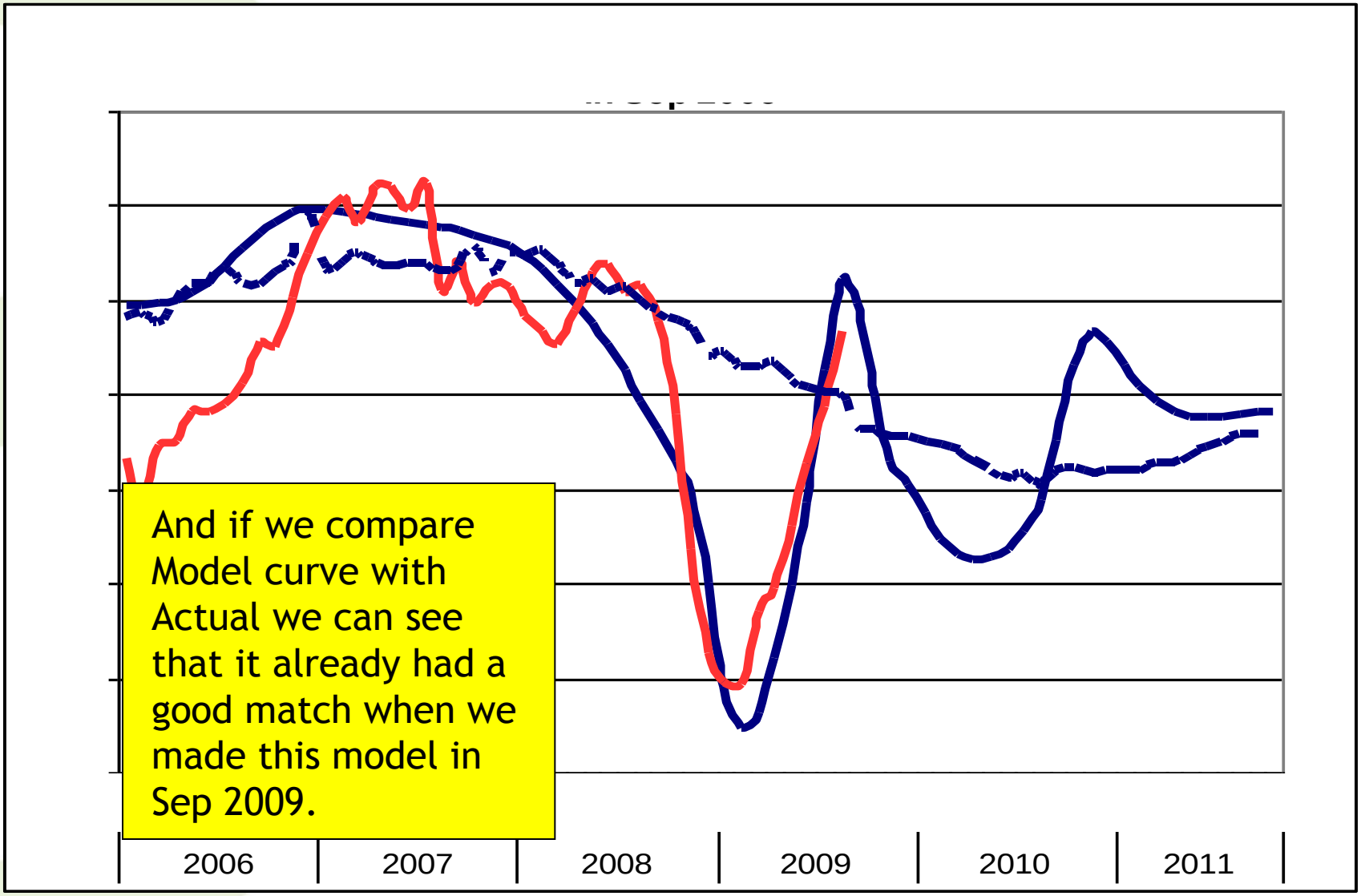


Upstream demand

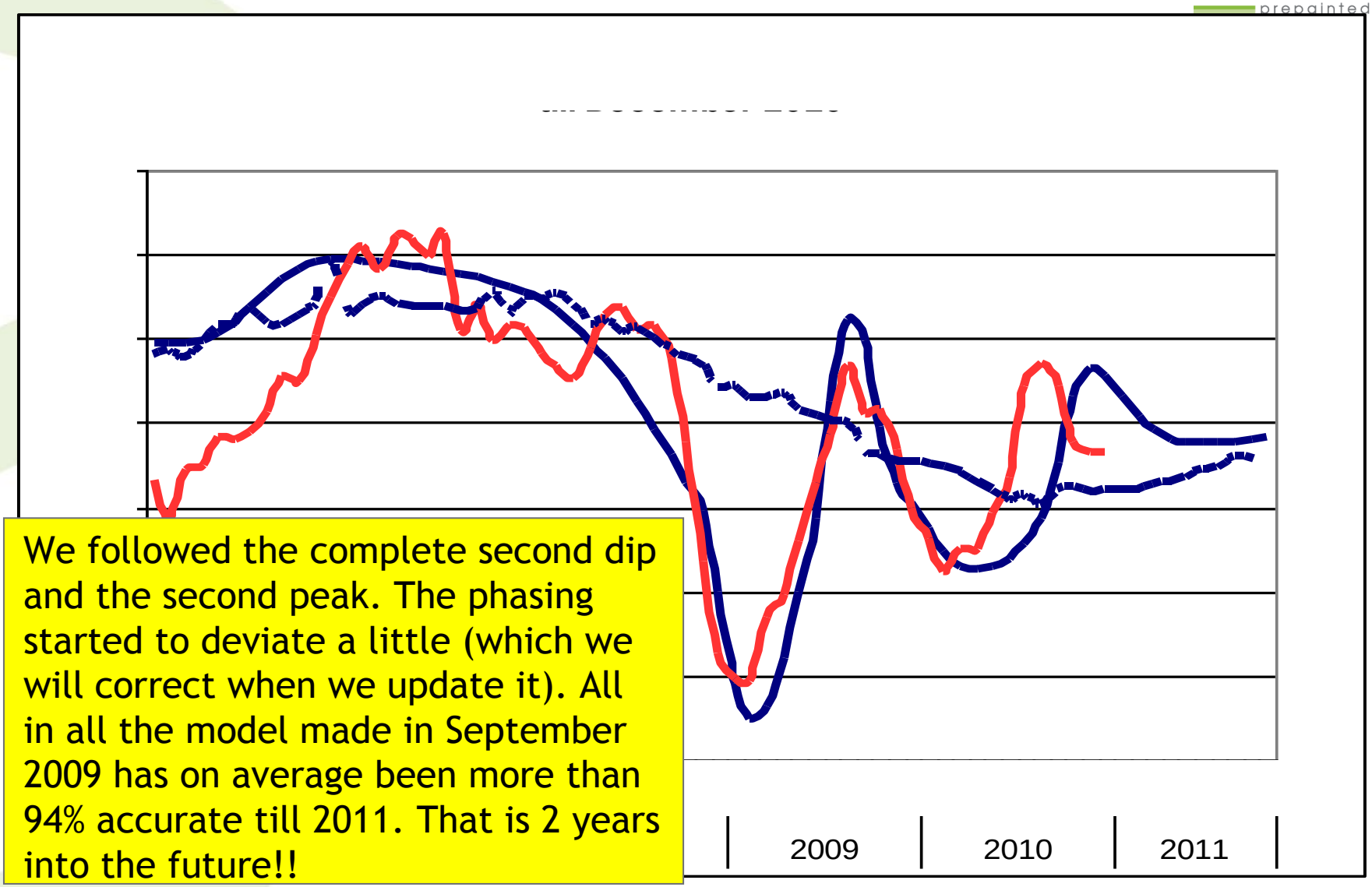
So we put in the end market and a 10% de-stocking pulse and run the model for a period of 6 years.


This is the model curve that was generated.
2006
2007
2008
2009
2010
2011

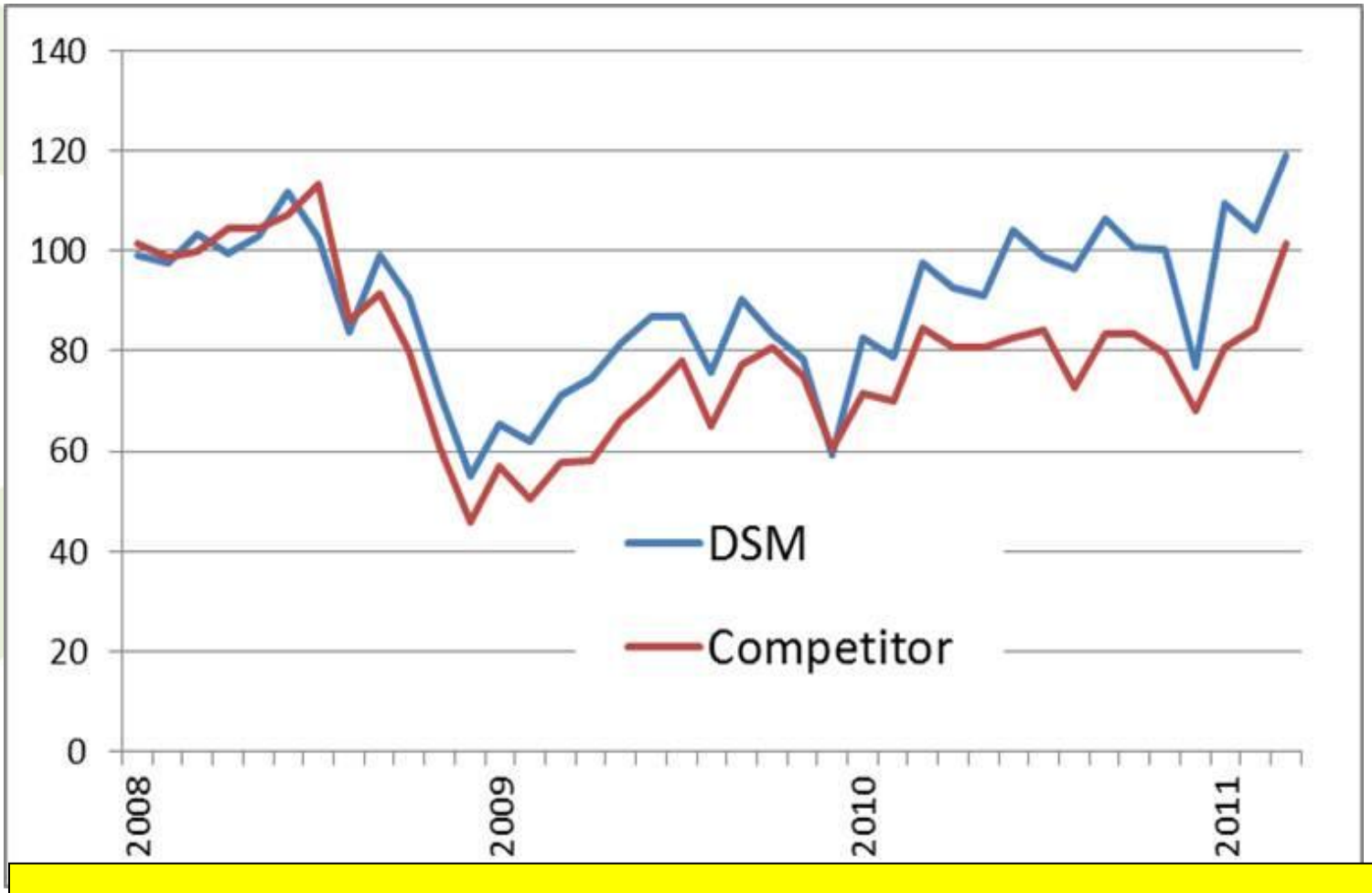

And if we compare the Model Curve with its end market we can see that the Lehman de-stocking pulse gave it a strong swing.
2006
2007
2008
2009
2010
2011



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.



We followed the complete second dip and the second peak. 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 on average been more than 94% accurate till 2011. That is 2 years into the future!!

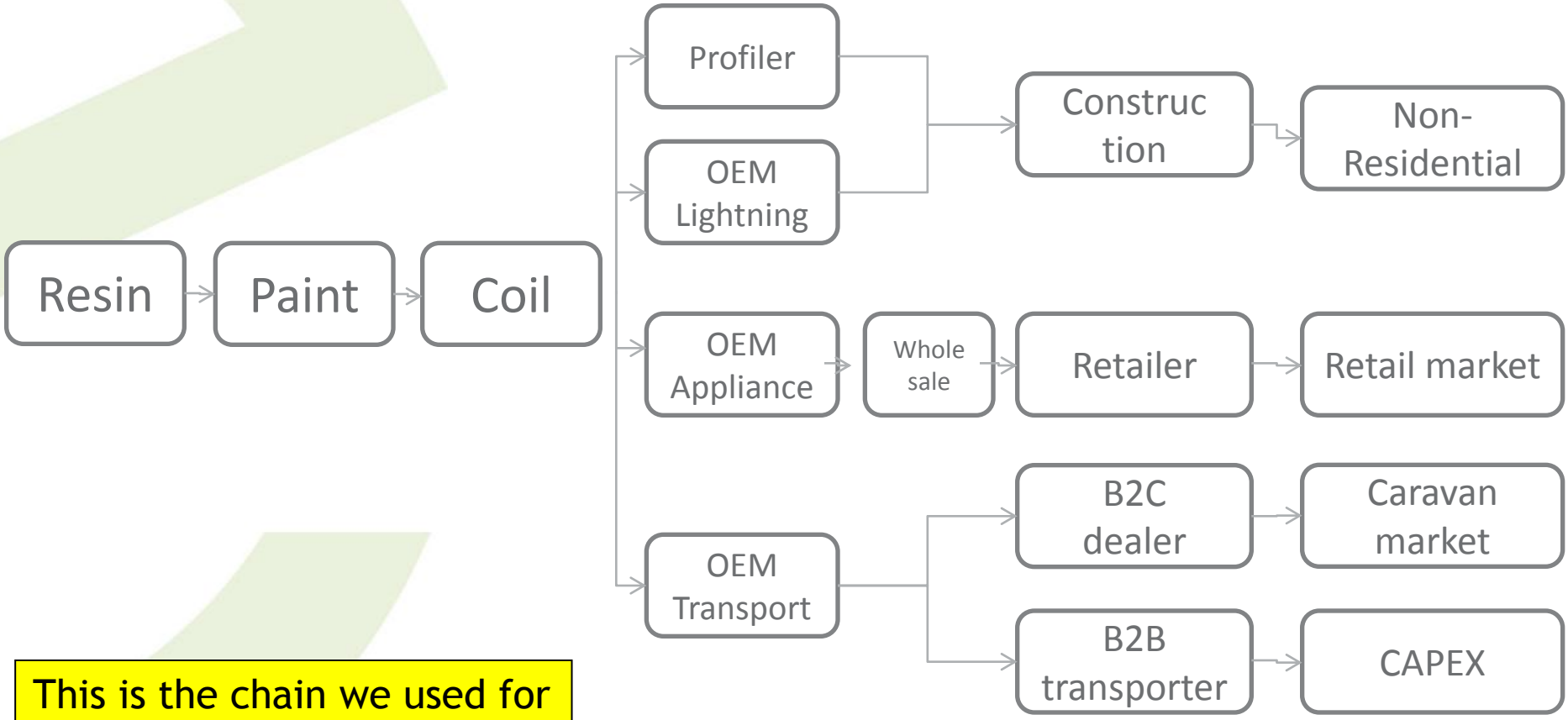


In this graph, which was published in ECJ by Flostock & DSM on October 7, is shown how the turnover of DSM Coating Resins compares with the published data of a direct competitor. DSM had early knowledge of the model and did not close factories or lay-off crucial people and started earlier to rebuild stocks. The cumulative delta between the two curves is 250 million Euro and 15-20% MS.

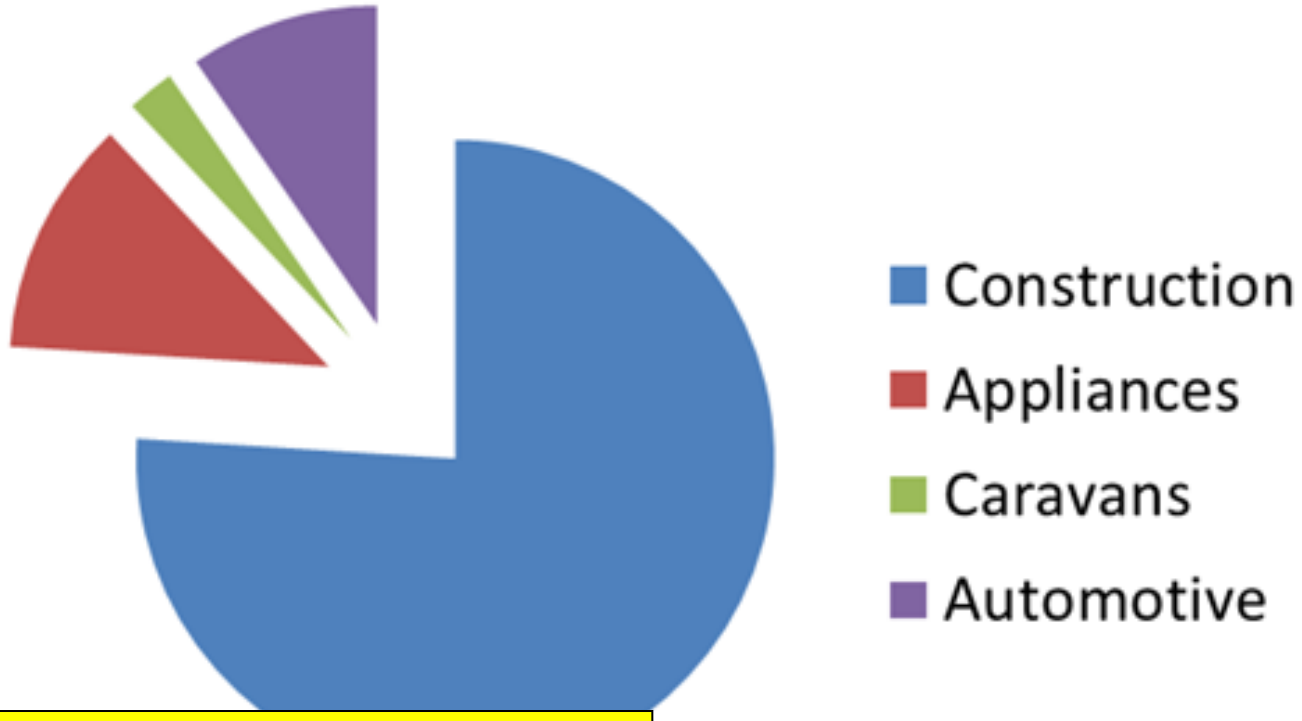
COIL

The first model we ever built was for Coil because we had lots of supply chain info via ECCA. For this presentation the old model was updated with recent info.

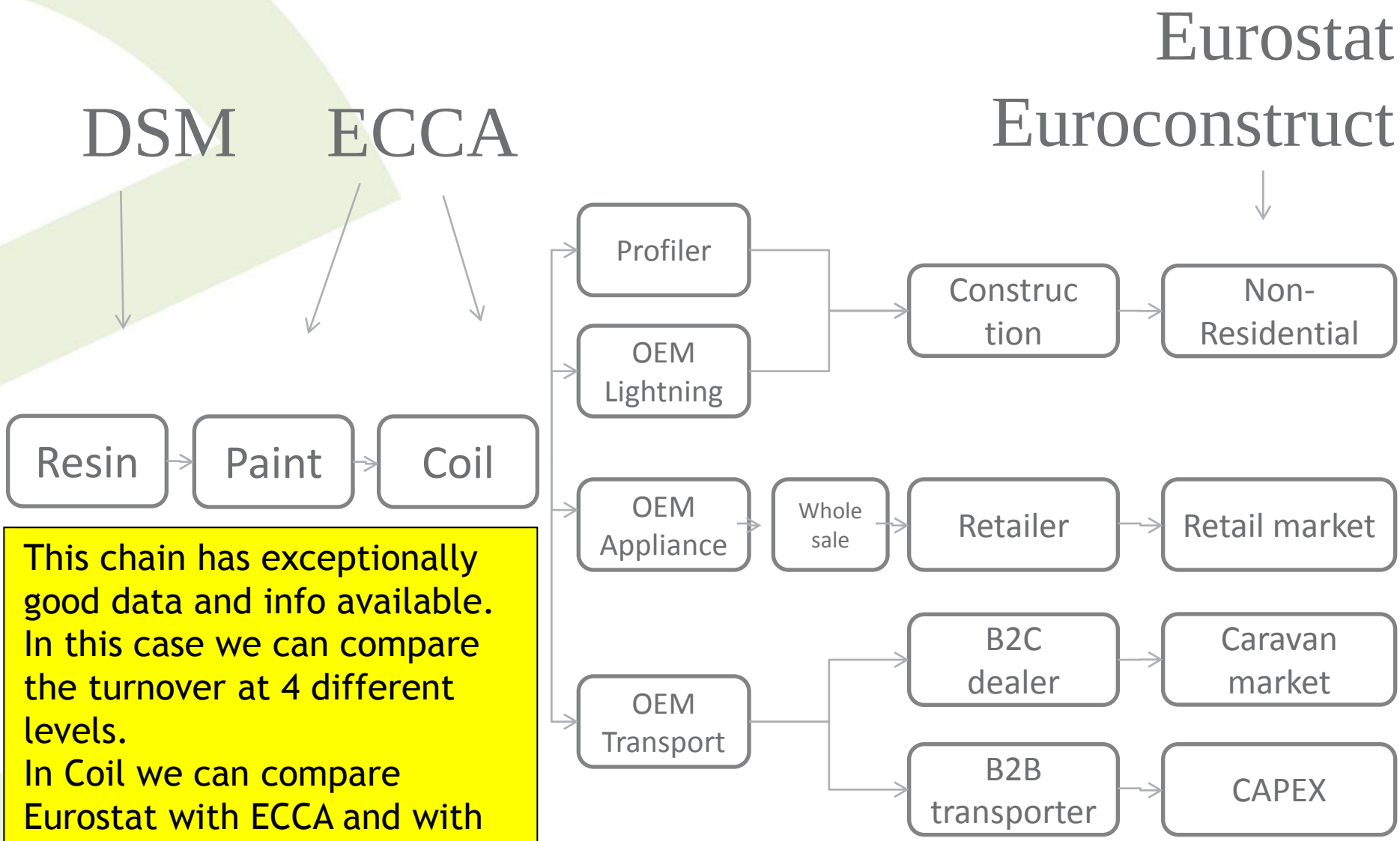
Coil Supply Chain



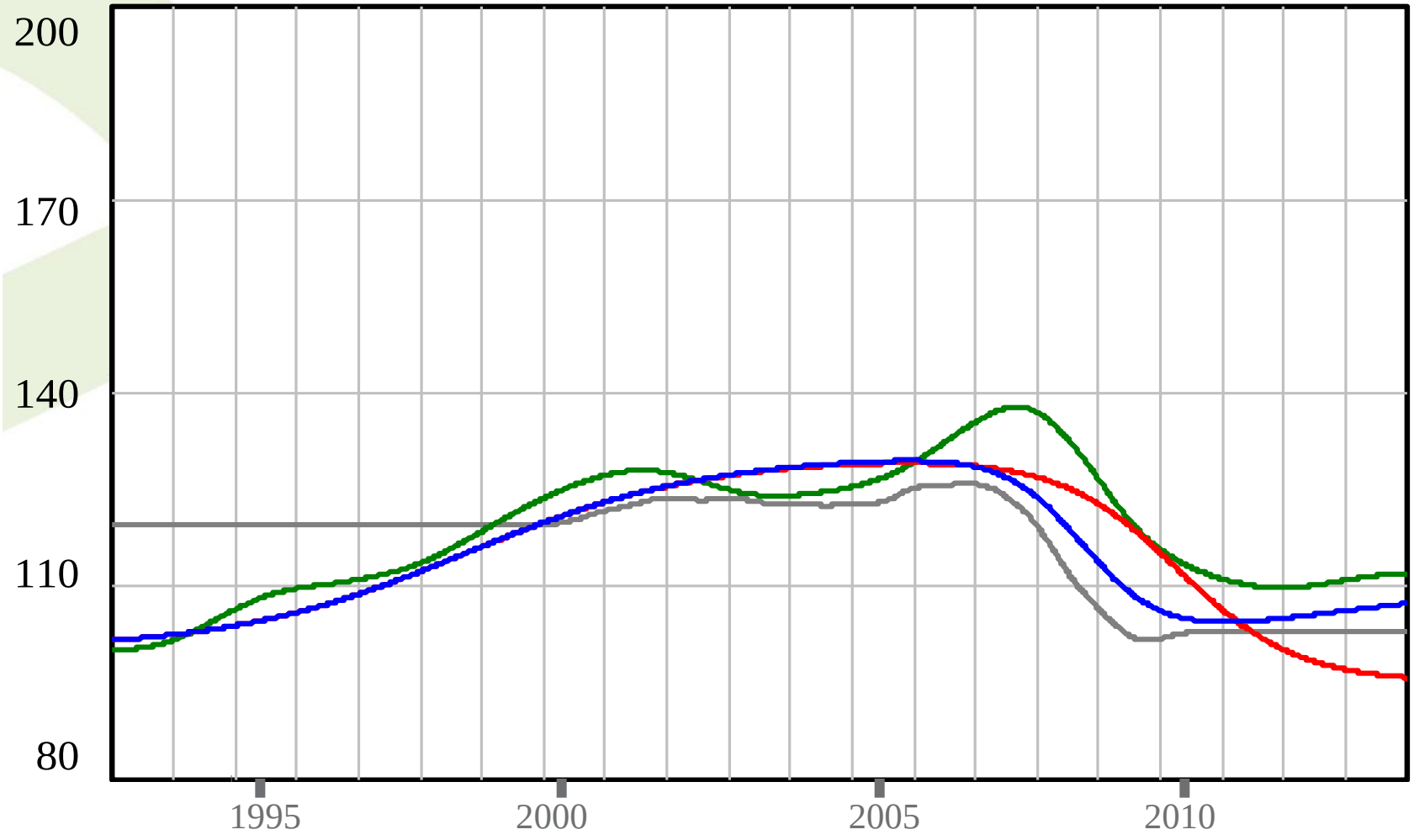
This is the chain we used for Coil



The main market is Construction. Some other markets that are used in this industry, such as stockists and miscellaneous are not end markets and their turnover has been divided over the other chains.



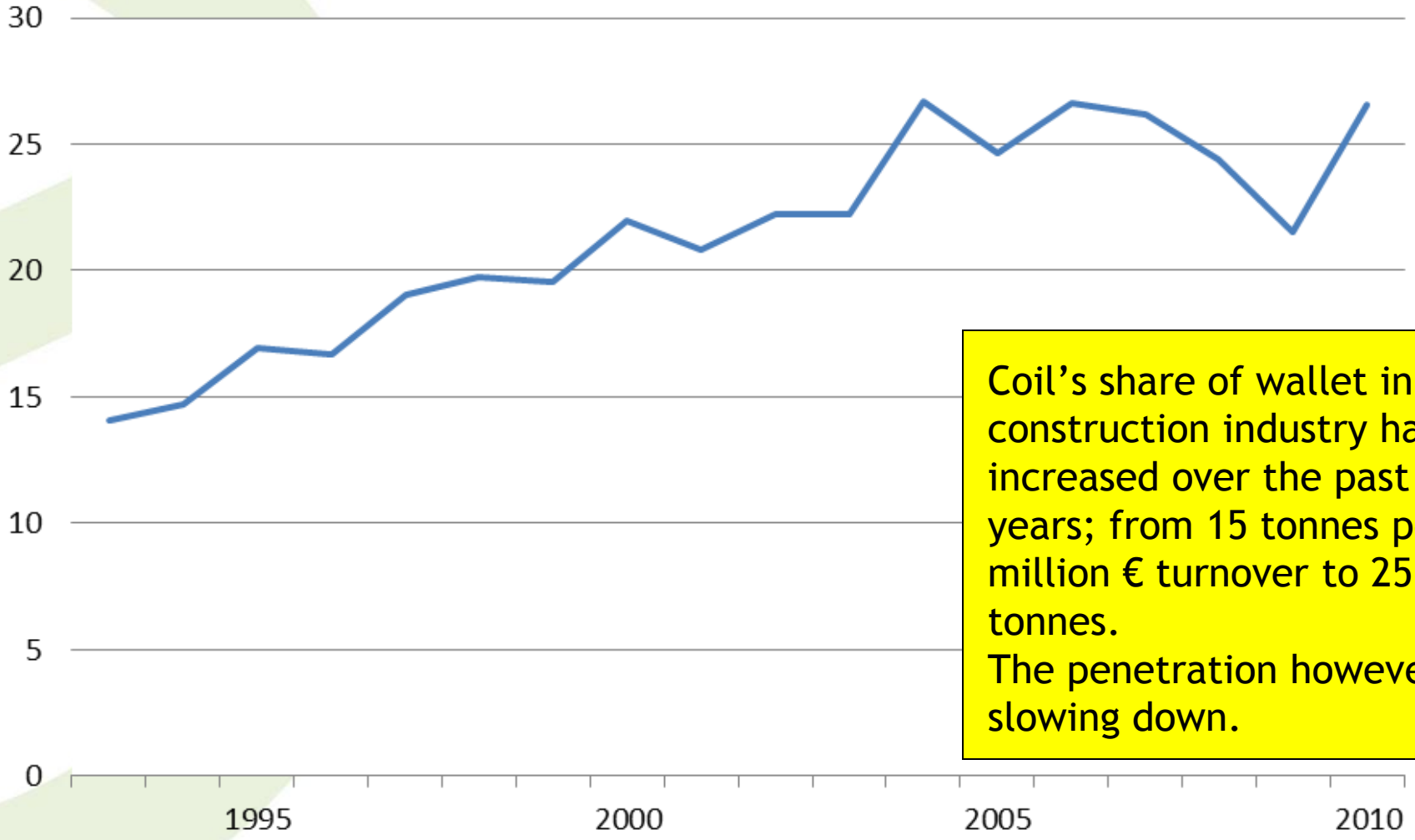
This chain has exceptionally good data and info available.
In this case we can compare the turnover at 4 different levels.
In Coil we can compare Eurostat with ECCA and with Model curves.



The end markets for Coil

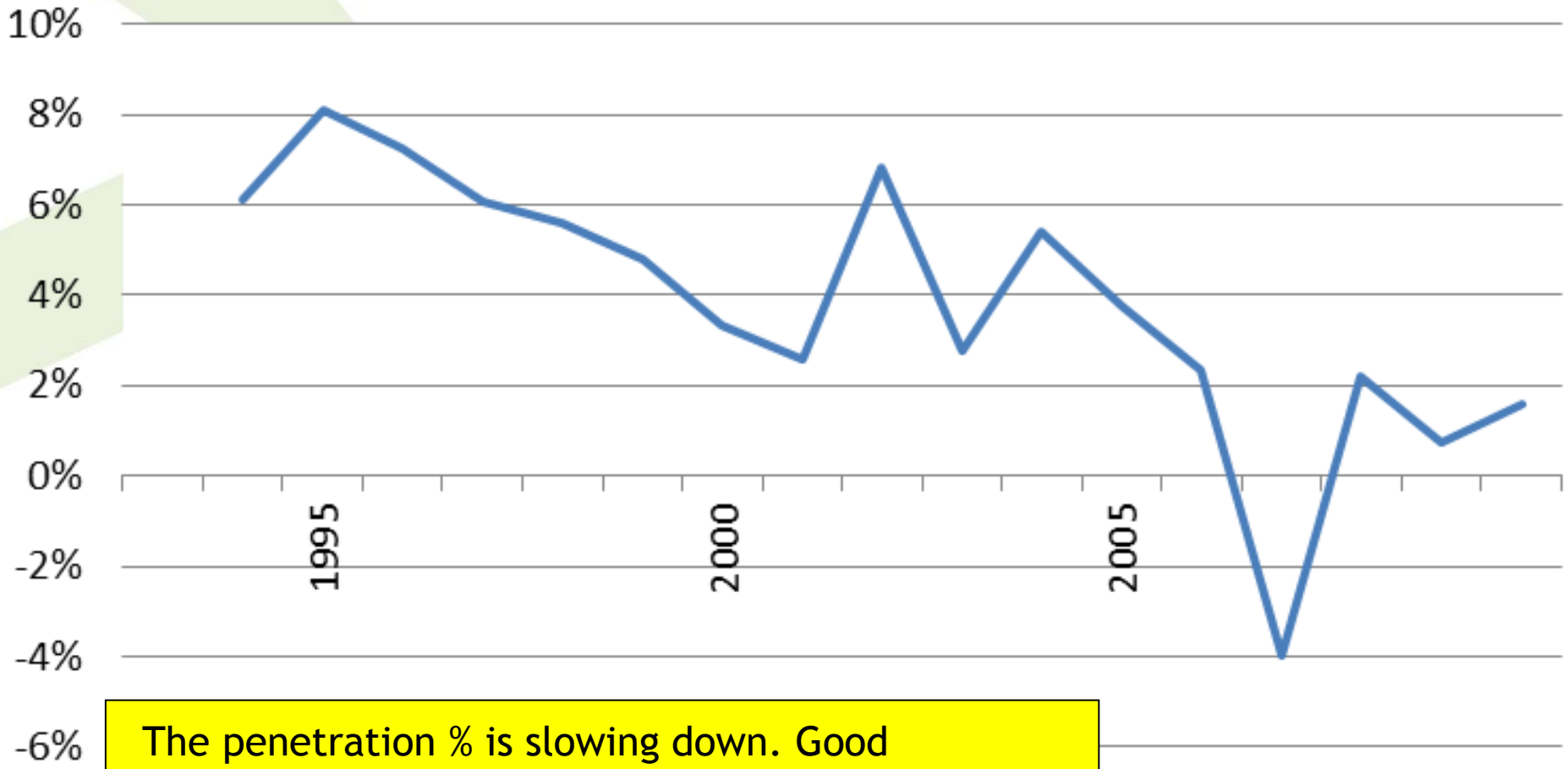
Coil penetration

(mt coil / million € construction)

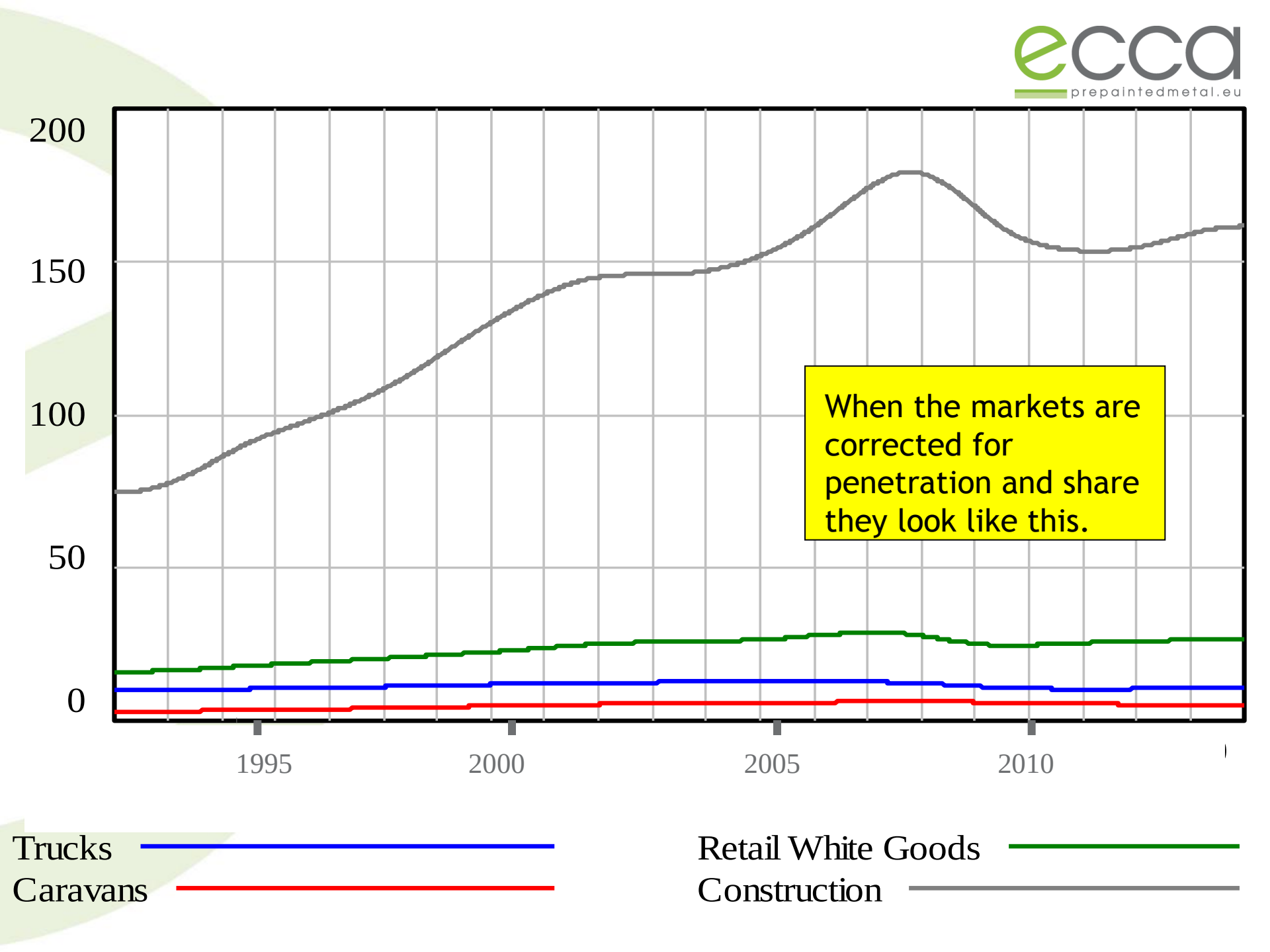


Coil's share of wallet in the construction industry has increased over the past 20 years; from 15 tonnes per million € turnover to 25 tonnes.
The penetration however is slowing down.

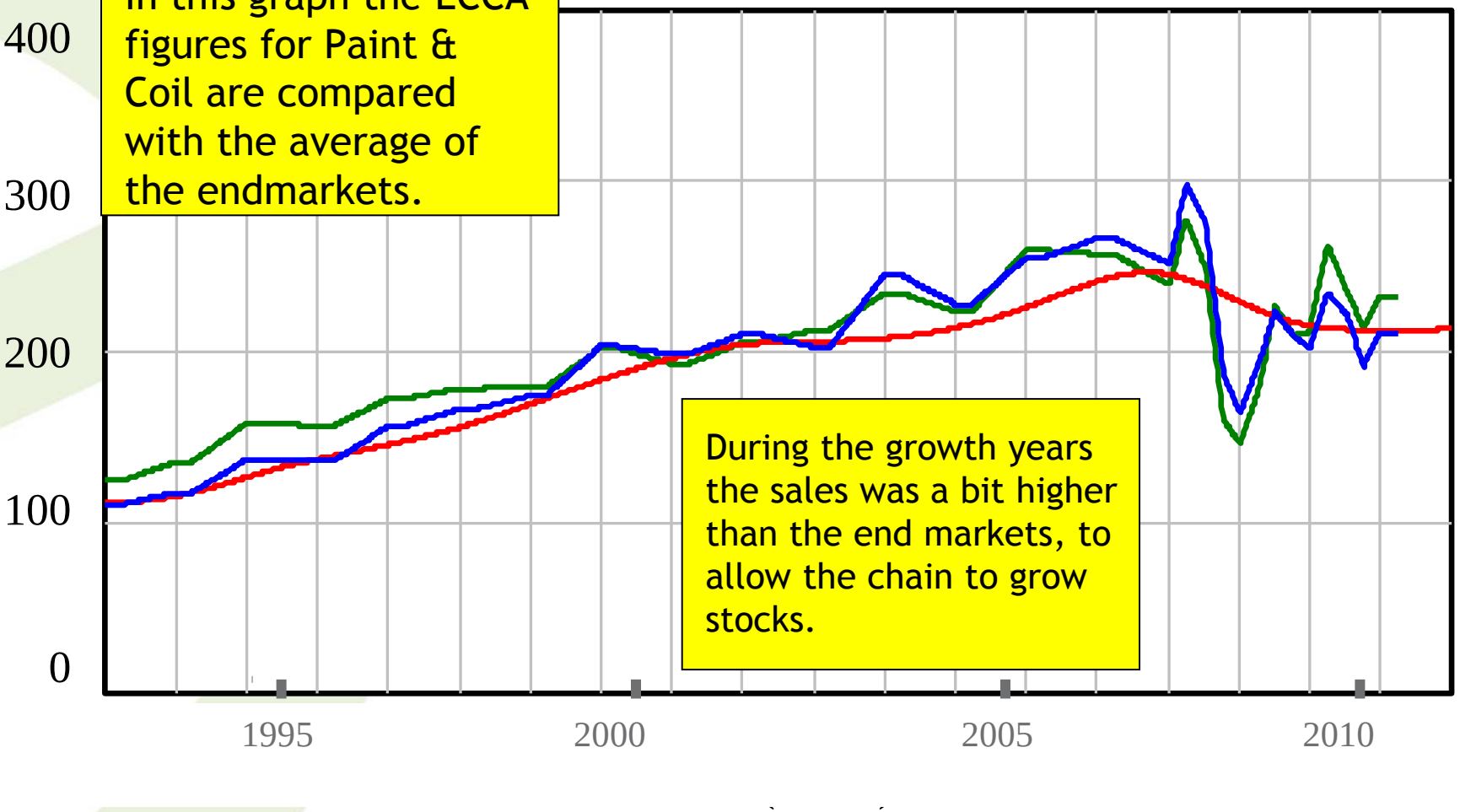
Penetration Coil YOY



The penetration % is slowing down. Good modeling could show each year how much the penetration is, without the picture being confused by stock changes.

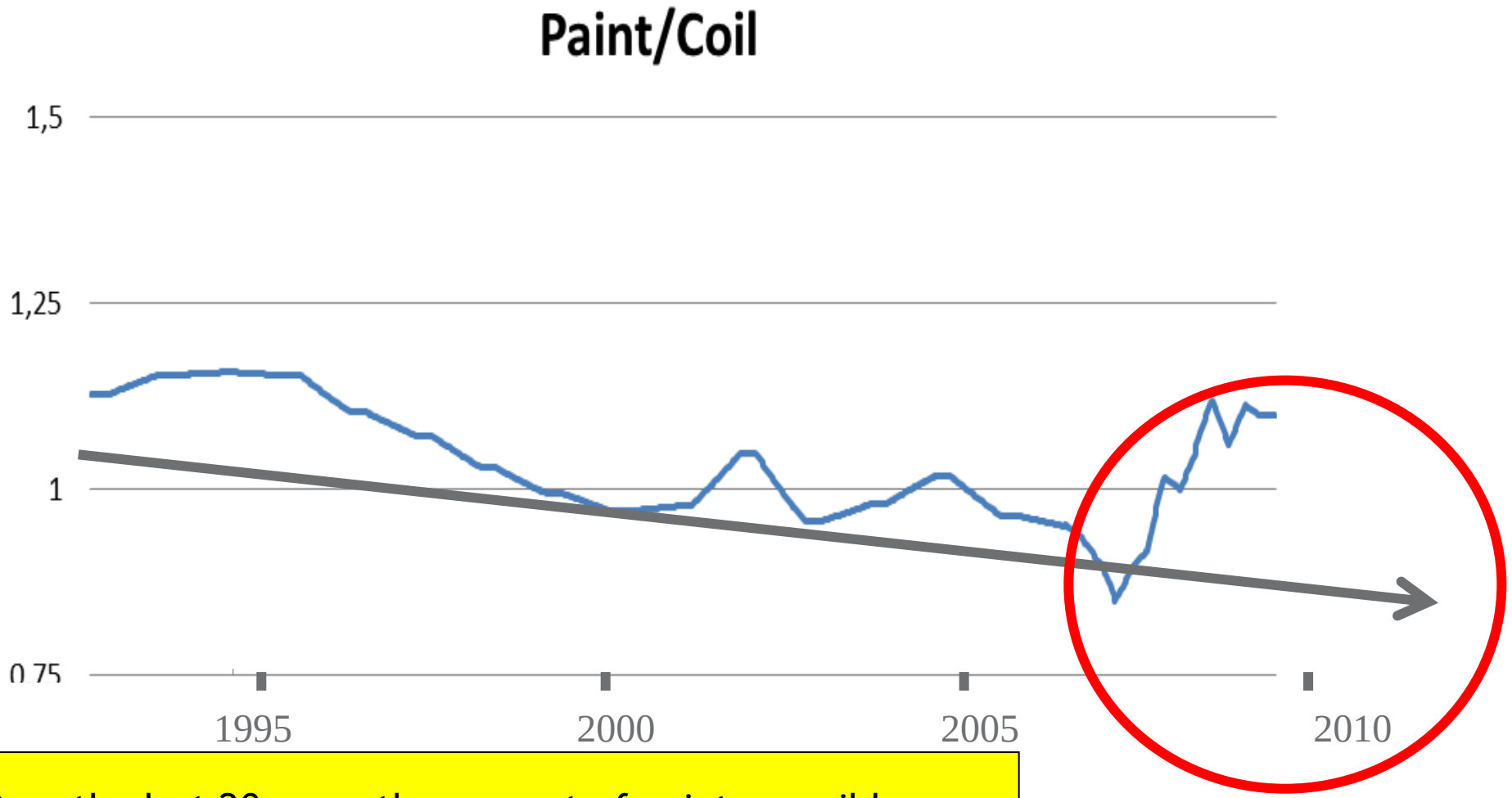

200
150
100
50
0
1995
2000
2005
2010
When the markets are corrected for penetration and share they look like this.
Trucks
Caravans
Retail White Goods
Construction

ECCA Paint & Coil



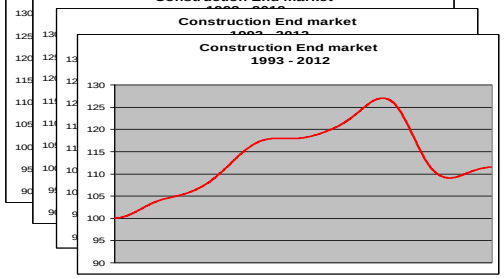
ecca prepaintedmetal.eu

flostock stock & flow analyses



Over the last 20 years the amount of paint on coil has gone down. This effect is not yet included in the models. The recent trend change is probably due to the Lehman Wave and not to a change in paint usage.

Dynamic modeling



End markets

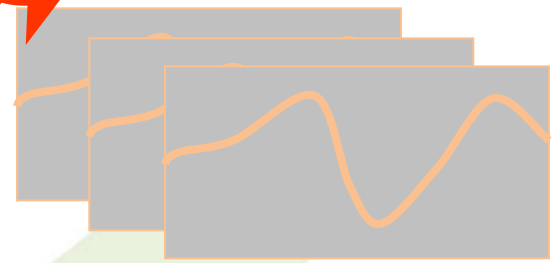
IN

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

Resin → Paint → Coil

- Profiler → Construction → Non-Residential
- OEM Lightning → Construction → Non-Residential
- OEM Appliance → Whole sale → Retailer → Retail market
- OEM Transport → B2C dealer → Caravan market
- OEM Transport → B2B transporter → CAPEX

OUT



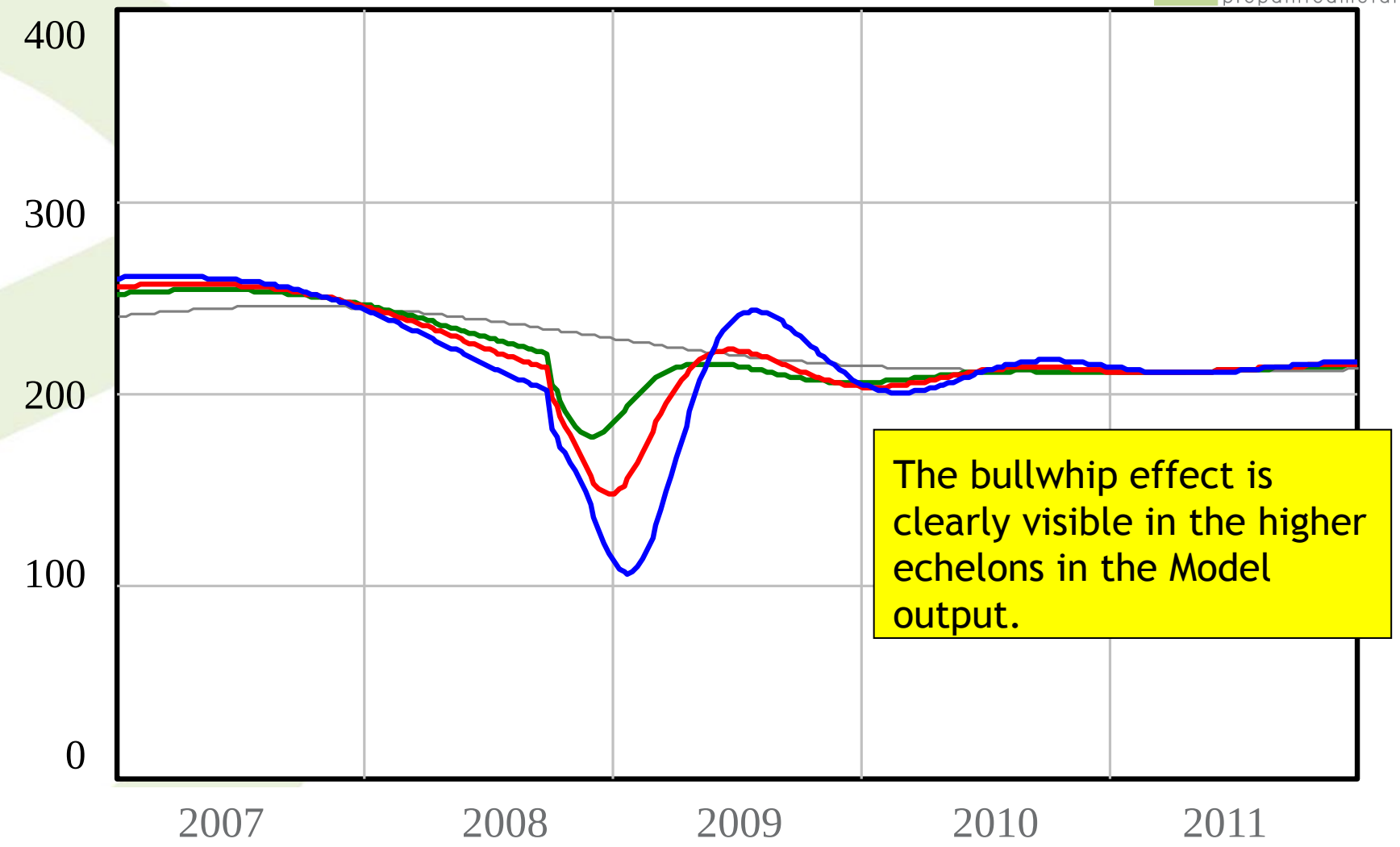
Upstream demand

Each block is a Company. Each company has a stock policy, with raw materials coming in and end-product going out. It is a simplified SAP system, if you like. Together these SAP systems form a value chain for a certain market segment.

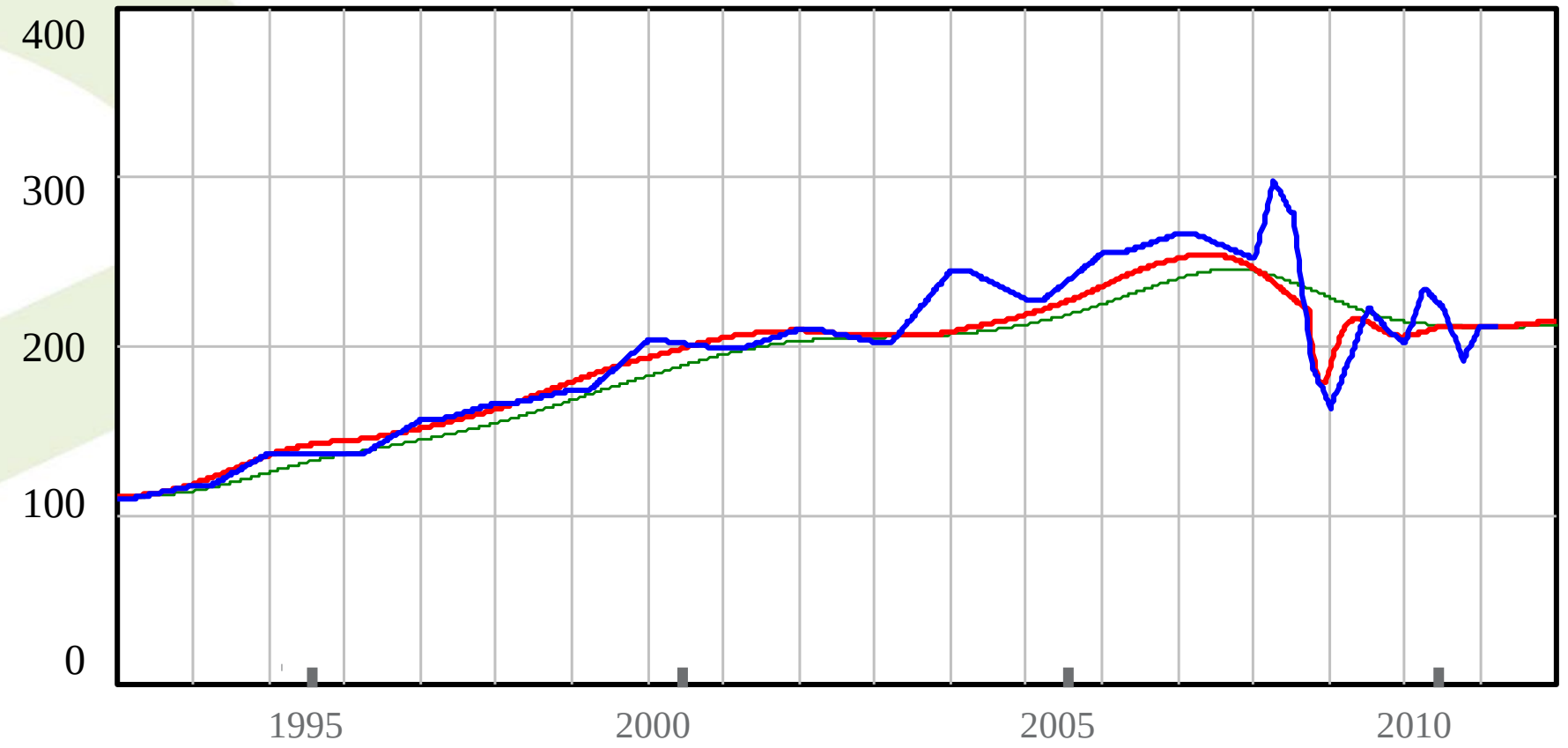
The model then runs for a period of 20 years. There is an end-market demand curve that triggers deliveries all through the chain. The stock policy can be changed during the period. The computer program can deliver the sales curves for all the steps in the chain.

TU/e Technische Universiteit Eindhoven University of Technology

COMPARING THE ECCA FIGURES WITH THE MODEL CURVES


400
300
200
100
0
2007
2008
2009
2010
2011
The bullwhip effect is clearly visible in the higher echelons in the Model output.
resin
paint
coil
End markets

Coil



ECCA Coil

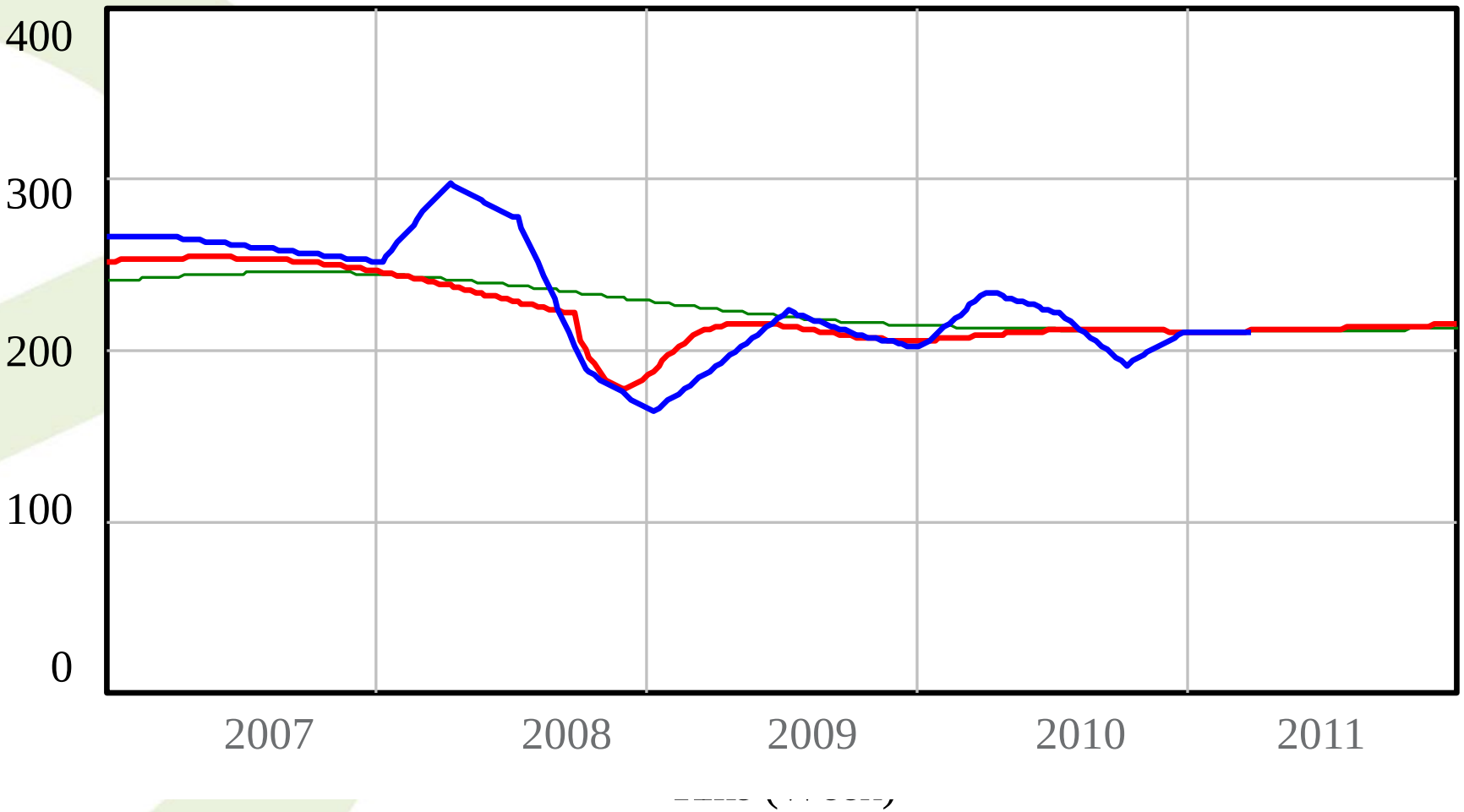
Model Coil

End Market

Here we compare Model forecast, made in 2009, with the ECCA figures that have been published meanwhile.

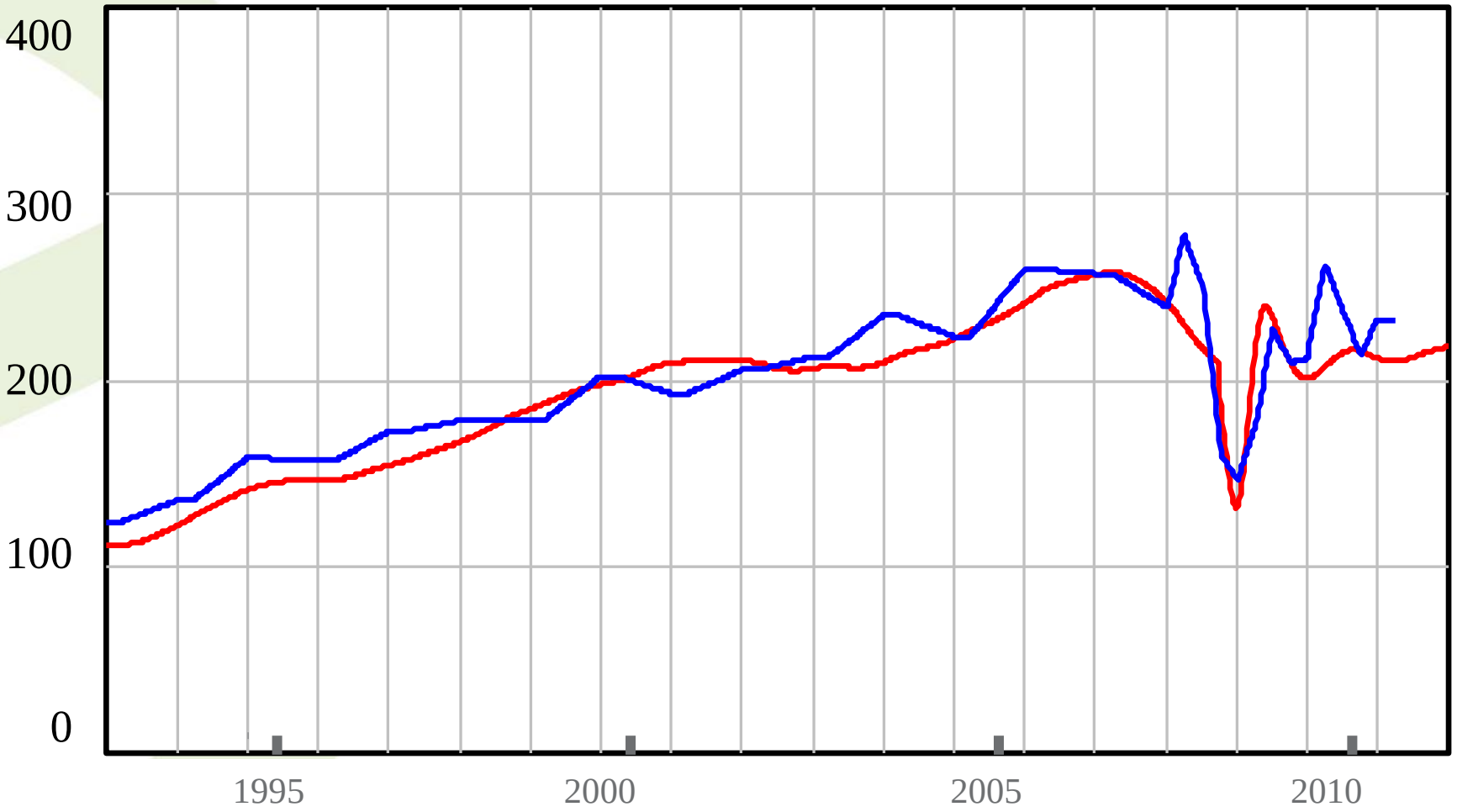
The strong peak in early 2008 can be due to stock piling caused by a (perceived) shortage.

Coil



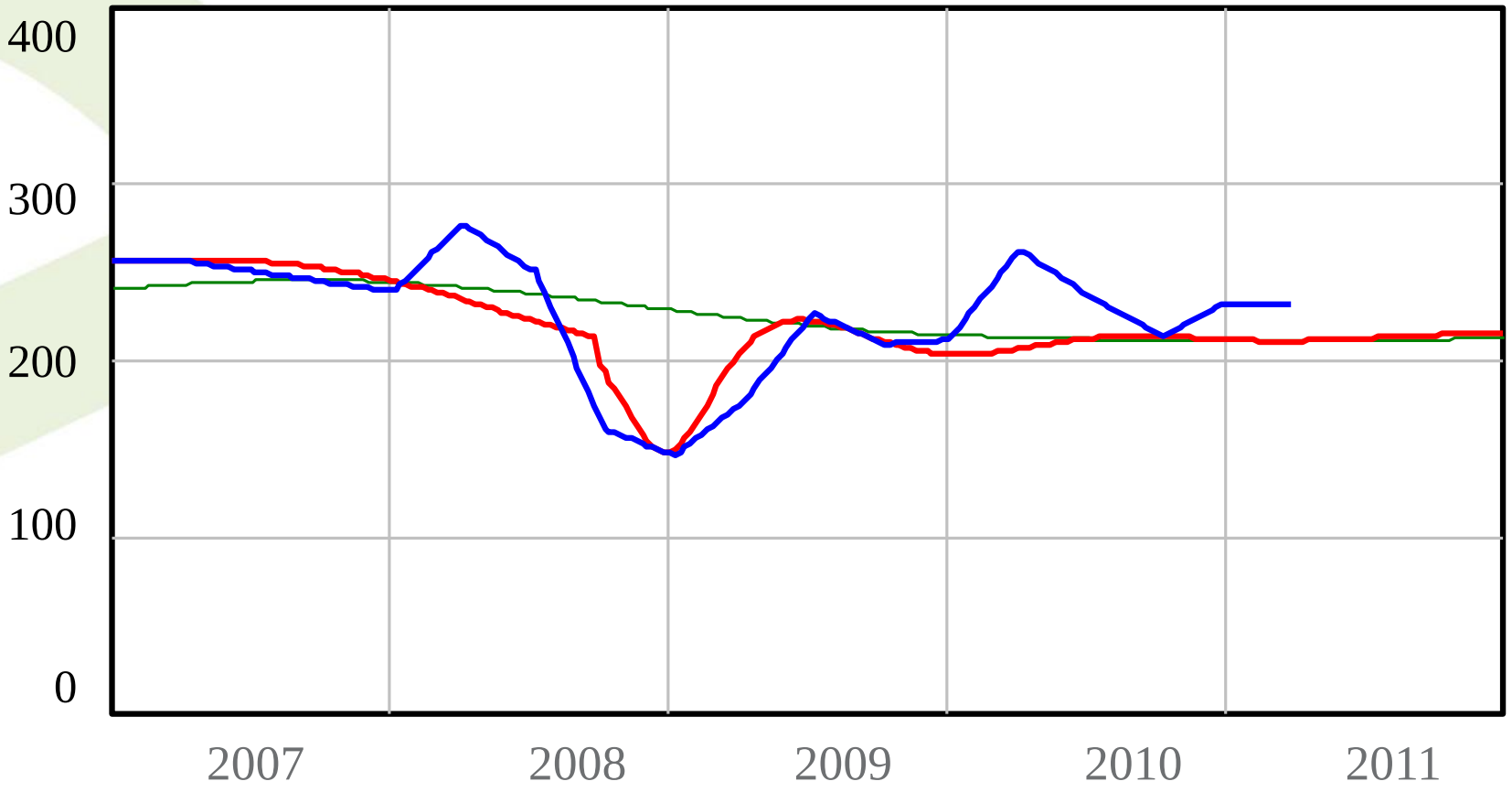
And if we zoom in we see that the dip was accurately forecasted. NB: the blue ECCA line is based on Q-figures and was not corrected for seasonality.

Paint



And here for Paint. One can see that the timing of the dip is consistent. The predicted 10% de-stocking explains the dip in ECCA figures.

Paint

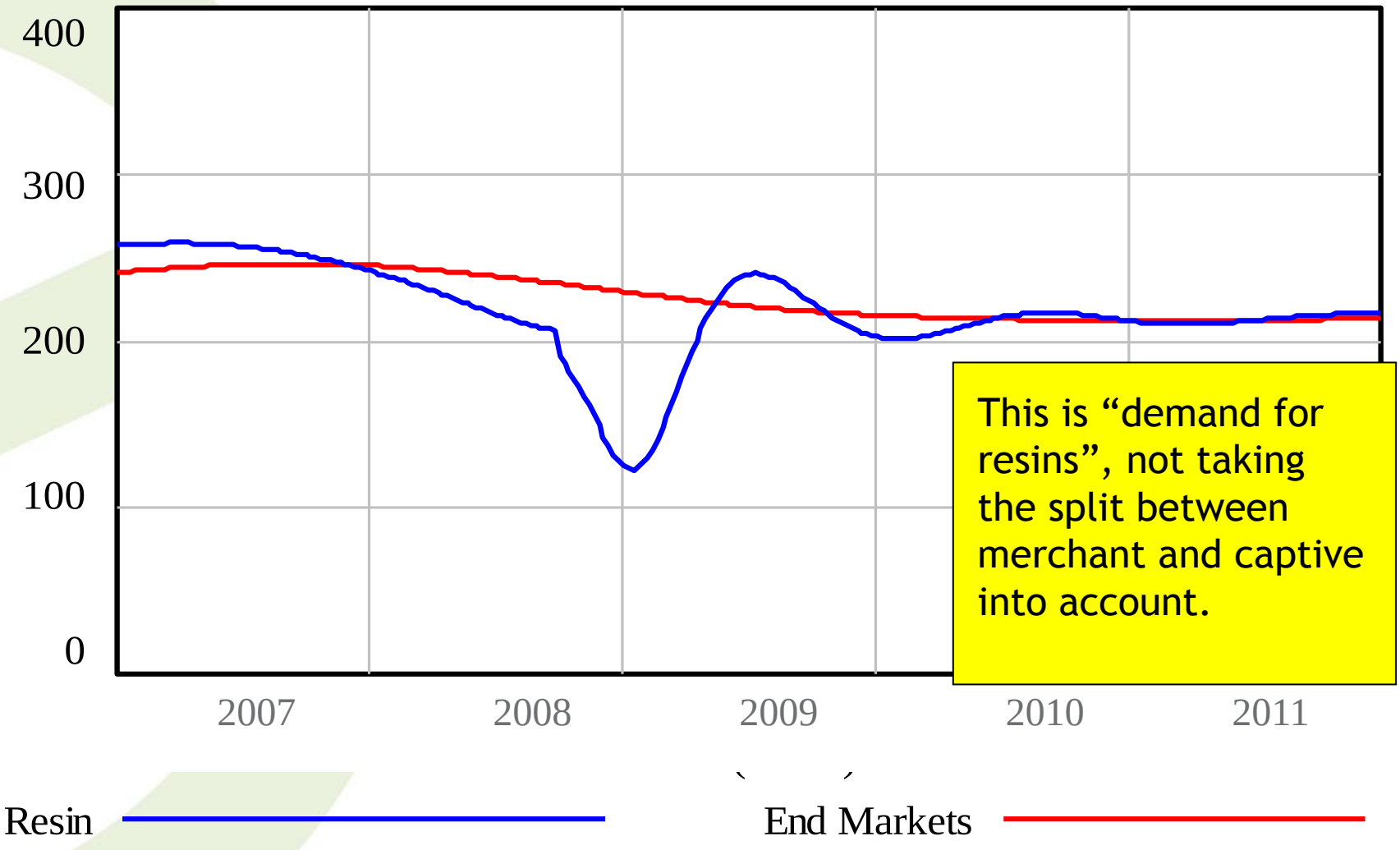


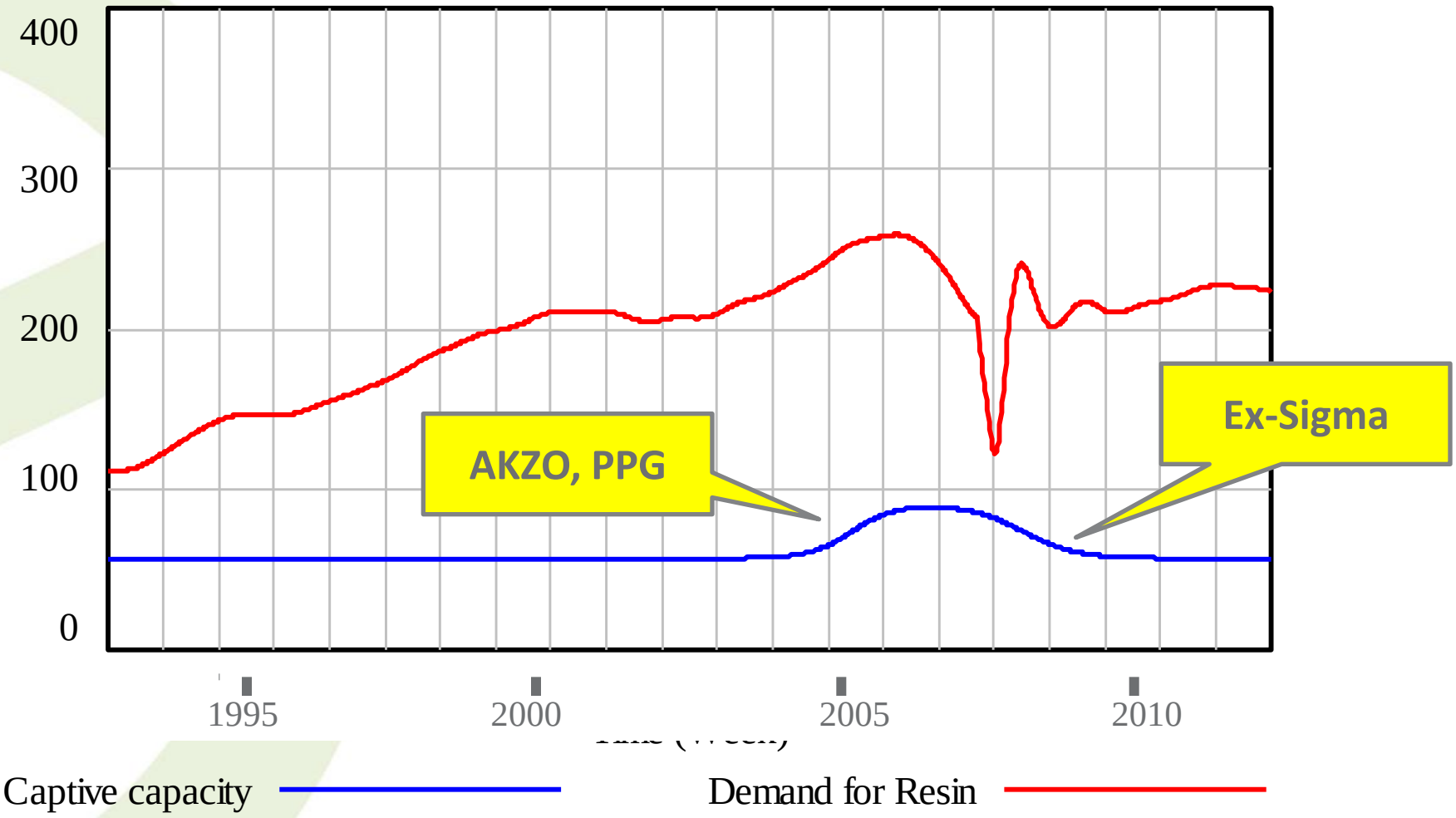
If the model is right, the sales levels that were published for Q1 2011 were higher than the end market, so the paint producers may expect that their sales will go down again.

CAPTIVE & MERCHANT RESINS

A “captive resin producer” is a paint producer who produces his own resins. In general such producer will keep his own capacity full to cover his fixed cost.

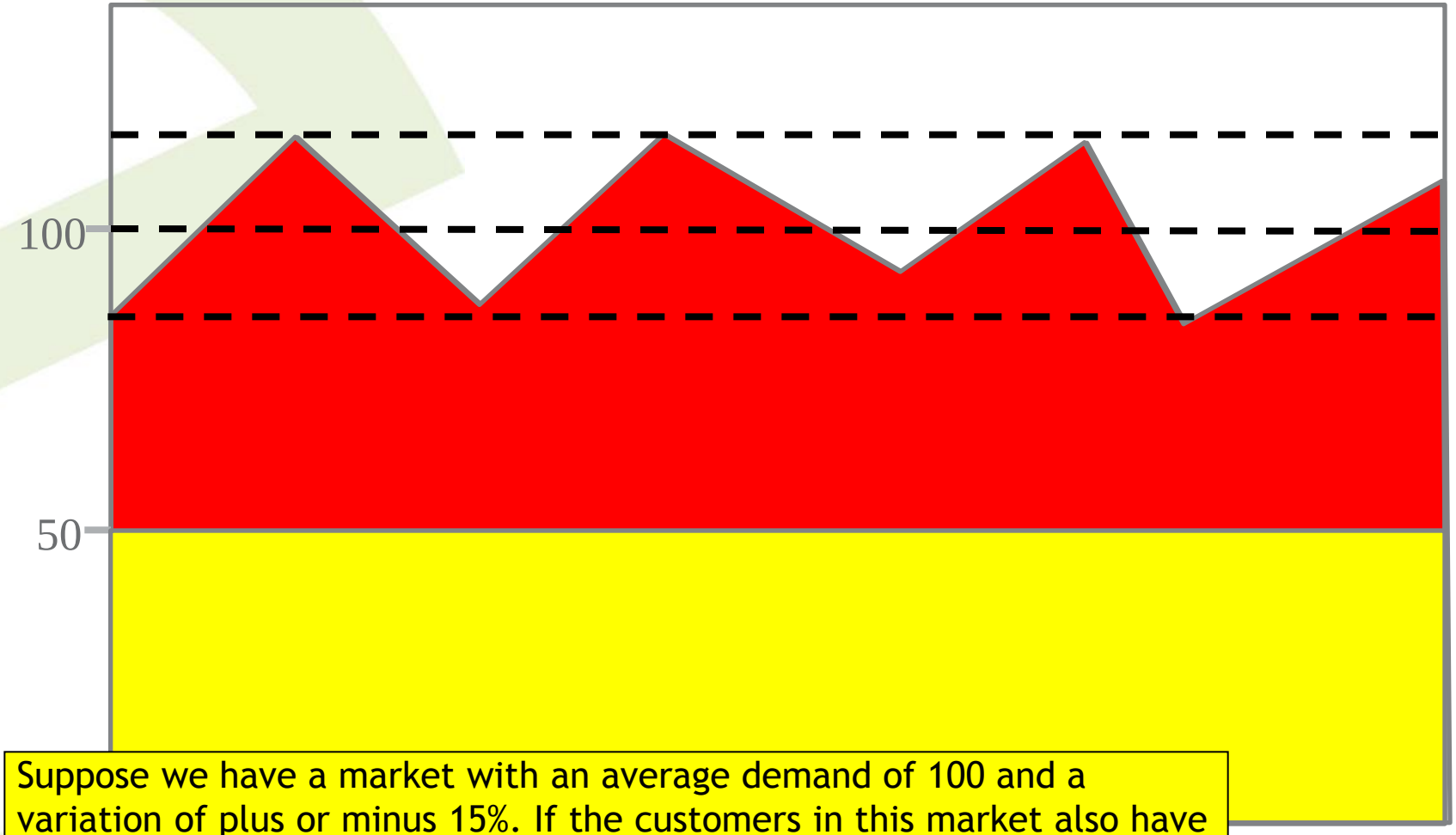

or resin specialists,
uch as DSM, this is an
xtra challenge.
icture is the Can &
oil polyester factory
f DSM in Meppen (D).


400
300
200
100
0
2007
2008
2009
2010
2011
This is “demand for resins”, not taking the split between merchant and captive into account.
Resin
End Markets

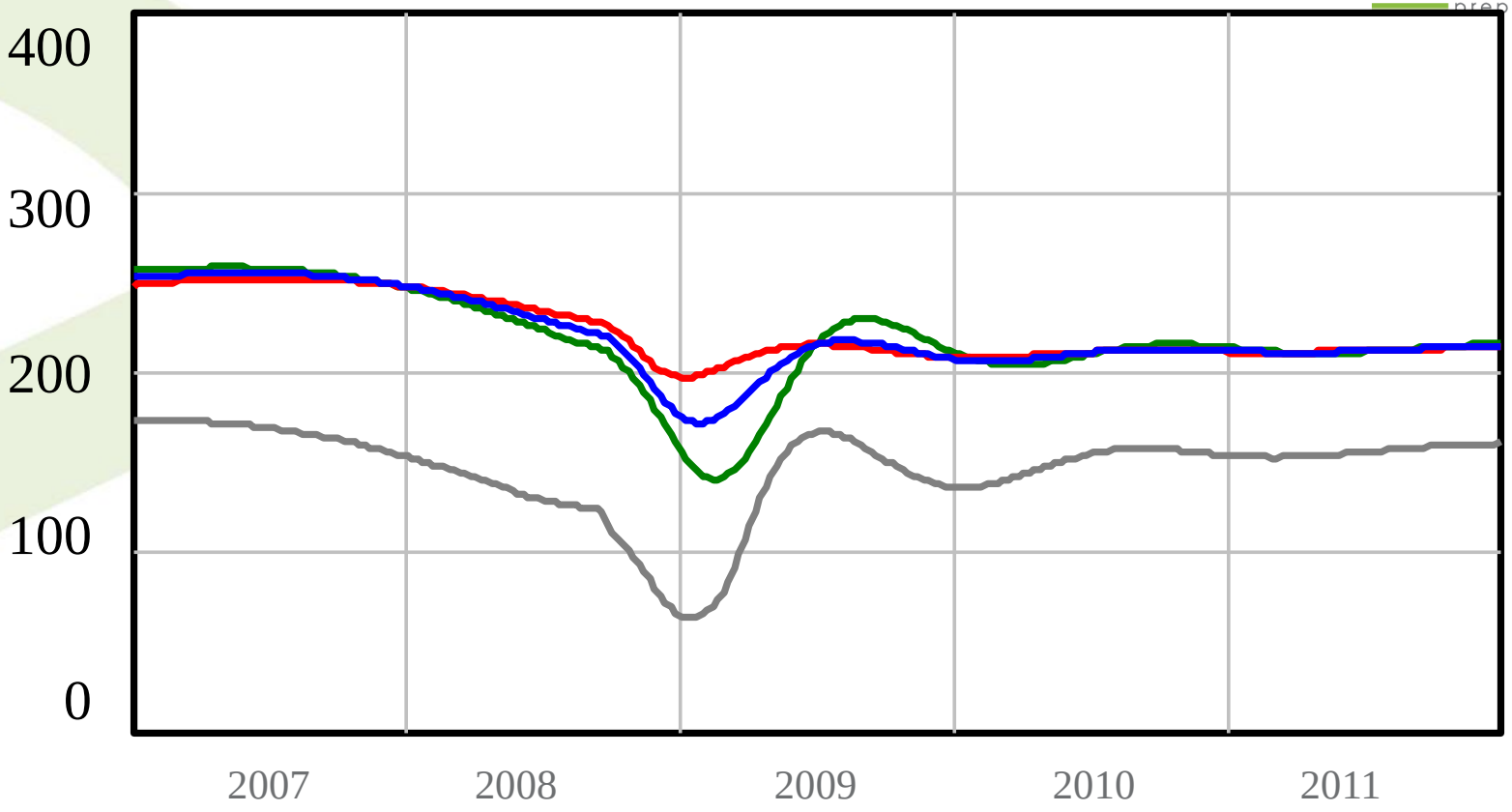


The blue line is an approximation for the captive capacity. Around 2005 AKZO and PPG expanded their capacity, and after 2008 the Sigma capacity became merchant again.

CAPTIVE RESIN PRODUCTION

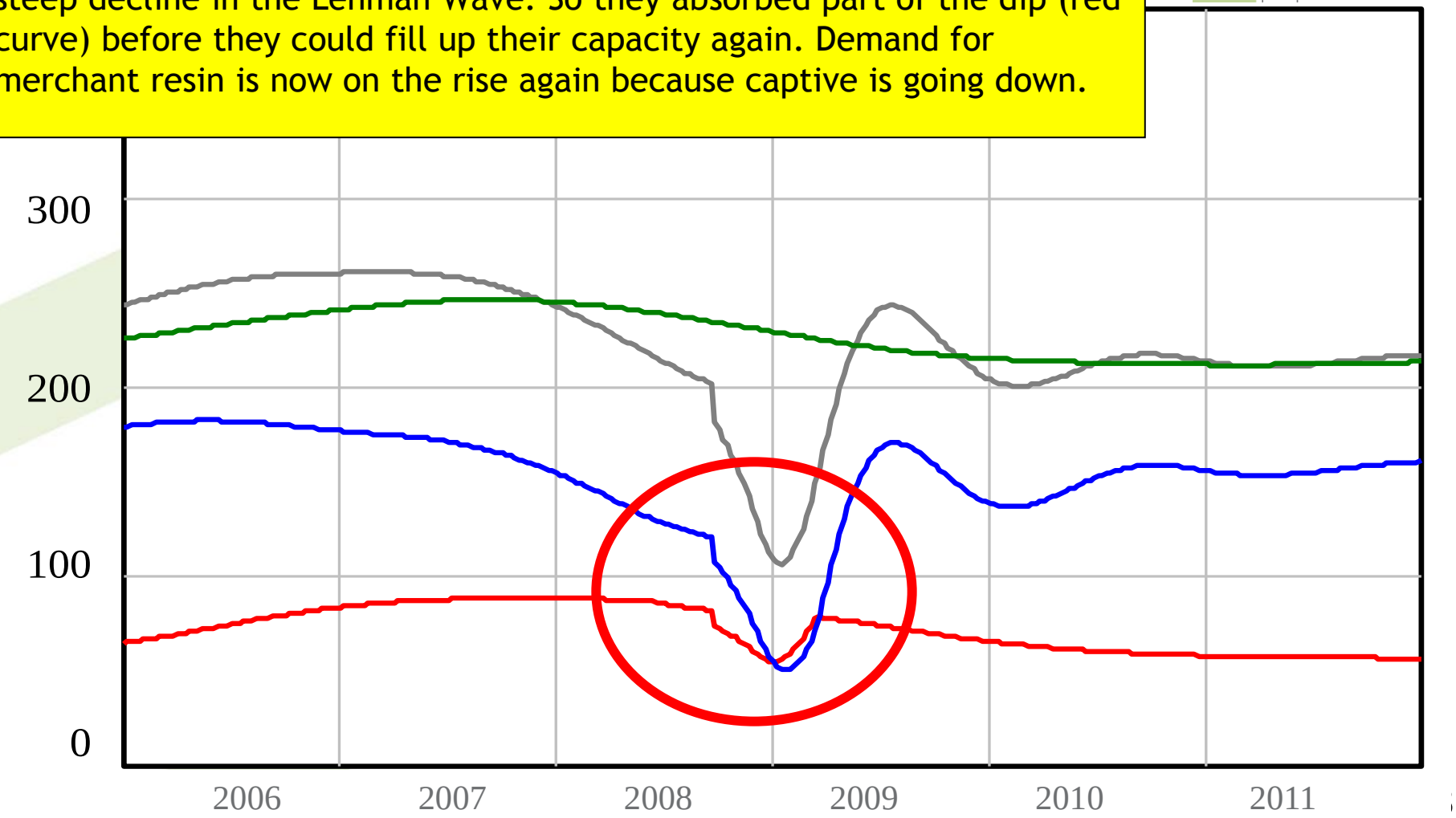


Suppose we have a market with an average demand of 100 and a variation of plus or minus 15%. If the customers in this market also have their own 50% captive production and if they give preference to their own production, as a result, for the merchant producers the volatility is 30% !



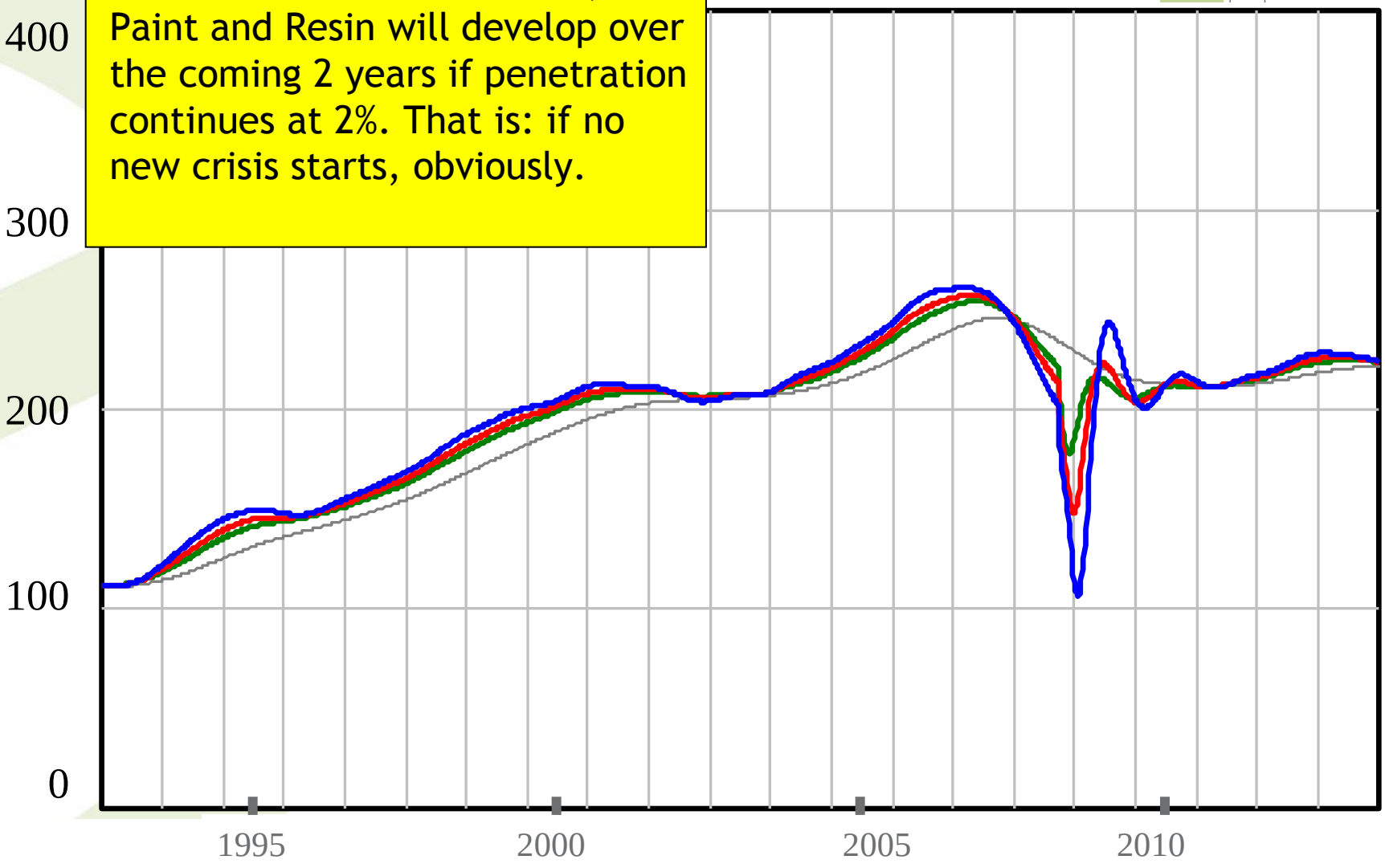
If indeed all volatility has to be absored by the merchant resin producers, this is the picture you will get. While total resin demand went down maybe 40% in the dip, the merchant player lost 65% of his business.

Fortunately the captive producers also could not keep pace with the steep decline in the Lehman Wave. So they absorbed part of the dip (red curve) before they could fill up their capacity again. Demand for merchant resin is now on the rise again because captive is going down.

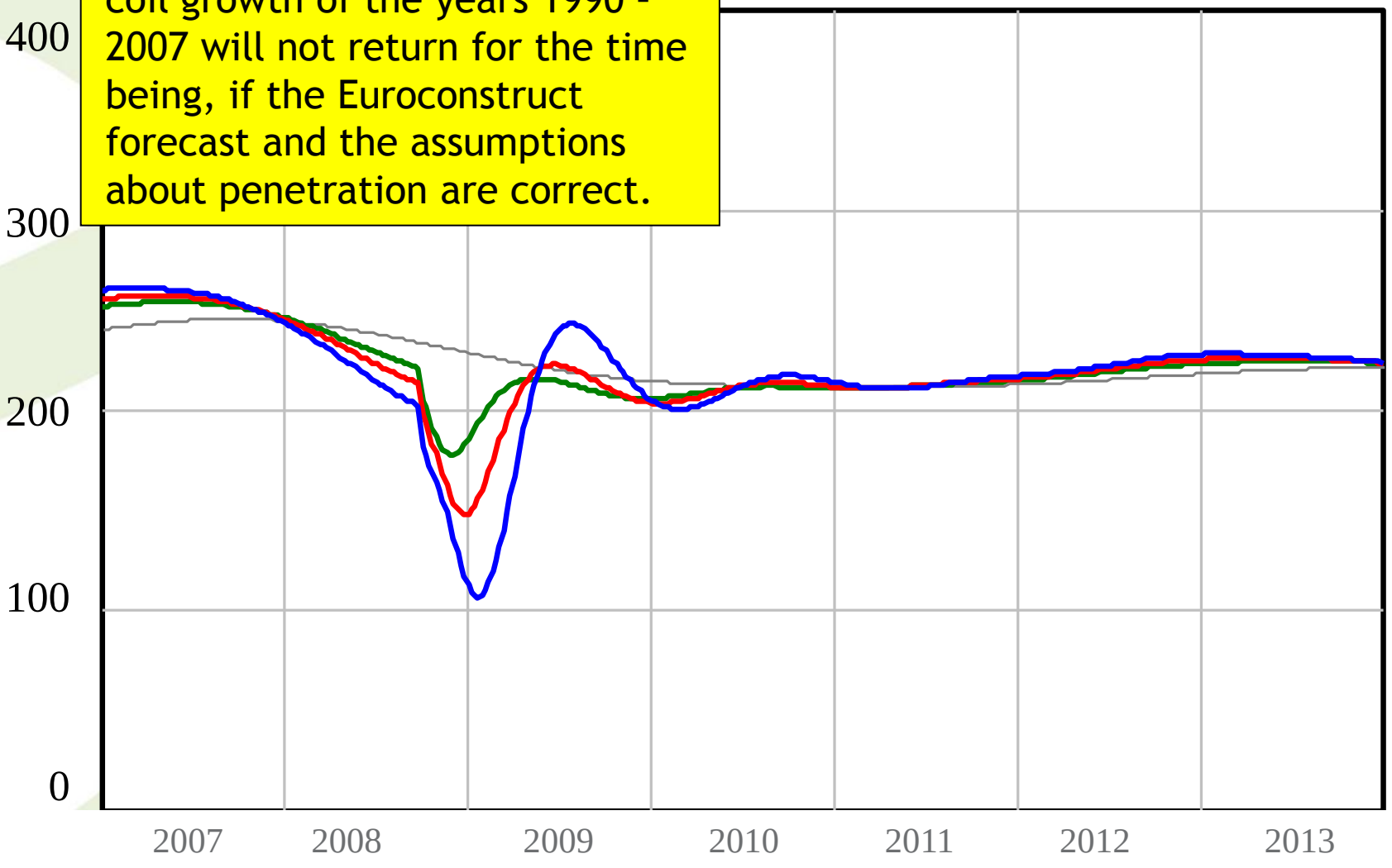


FORECASTING

This is how demand for Coil, Paint and Resin will develop over the coming 2 years if penetration continues at 2%. That is: if no new crisis starts, obviously.

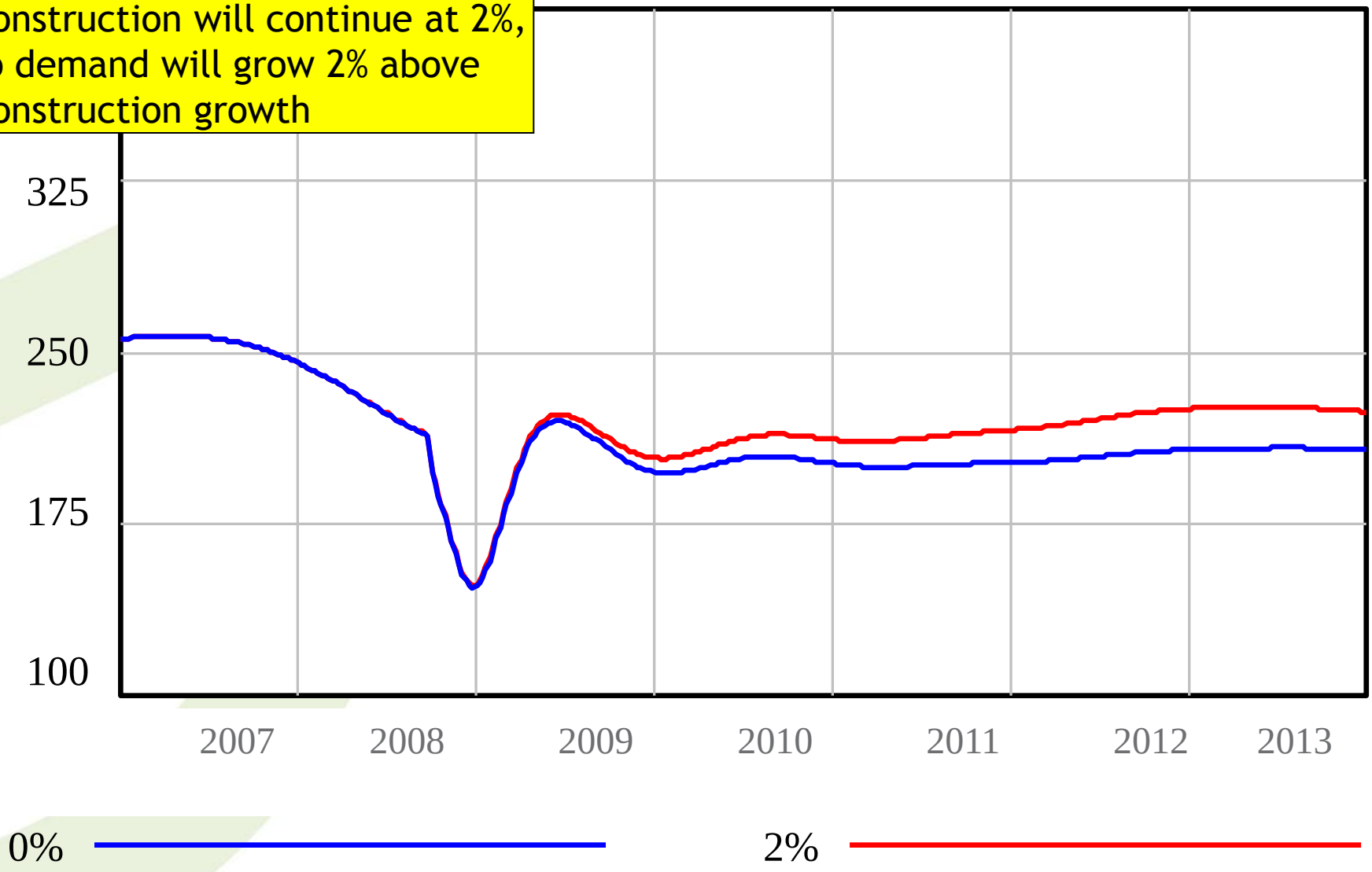


The peak year of 2007 and the coil growth of the years 1990 – 2007 will not return for the time being, if the Euroconstruct forecast and the assumptions about penetration are correct.



In the previous graphs we have assumed penetration of Coil in Construction will continue at 2%, so demand will grow 2% above Construction growth

Paint



What can be Forecasted?

- Predicting is difficult, especially the future
- Is Forecasting possible at all?
- “If you know how much it snowed in the Himalaya in winter – you can predict the water level in the Ganges in summer.”

Real Forecasting is possible as long as there is a cause – effect relation with delays or delayed feedback loops.

- Snow – river; Climate change; natural processes; seasons;
- Long term demographics: age pyramid, birth rate, population, GDP, GDP growth, consumption, technology trends
- Any regular wave; Oscillation
- End market Consumption pulls upstream production.
- Lehman Wave: elastic response
- Penetration in the market follows Whale curve
- Lehman Capacity Wave (!)
- Aging Fleet Syndrome (Automotive, Men's Underware Index, luxury goods, Machinery)

Conclusions

Lehman Waves shake the global economy; Once started, they can be predicted

End Markets determine most of your sales

Upstream companies suffer most

Captive capacity increases the volatility

Penetration of Coil in Construction may be finished: future growth will be lower

Modeling can distinguish between end market, stock changes and market share. It can explain Captive merchant and other complicated disruptions; and, with good end market info, predict the future.

Volatility increases the forecast accuracy

Forecasting is possible

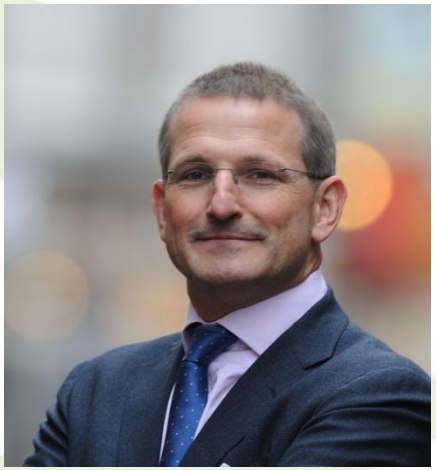
www.flostock.com

ecca prepaintedmetal.eu

Thank you

flostock stock & flow analyses

DSM BRIGHT SCIENCE. BRIGHTER LIVING.



CV Robert Peels

In 2011, after 23 years in Royal DSM, Robert Peels started a consultancy named Flostock to make a new way of demand forecasting available to the industry. He has presented his findings at several conferences and published them in numerous journals and magazines, most recently in the European Coatings Journal of October 2011.

In 2008 he was strategy director in coating resins in DSM. In this capacity he analyzed the financial crisis and built a supply chain based forecasting model with the Technical University of Eindhoven. This model has correctly predicted demand over the last 2 1/2 years, based on the insight that the crisis in the industry is largely caused by inventory reduction.

Before that he was business director, also covering the European coil paint market for a number of years, and before that sales manager, supply chain project manager, and European patent attorney, starting with a degree in biochemistry and business economy.

Peels works and lives mostly in The Netherlands. He can be reached via www.flostock.com or at +31 6 11356703

ecca
prepaintedmetal.eu

flostock

stock & flow analyses

www.flostock.com

DSM
BRIGHT SCIENCE. BRIGHTER LIVING.