A new approach for

Demand Forecasting

in the Paint & Coatings market

CEPE, September 2012,

by Robert Peels

flostock
stock & flow analyses

Principles of Flostock modeling

After a good number of years in DSM, of which 10 in coating resins, I have started my own company Flostock in 2011.

Principles

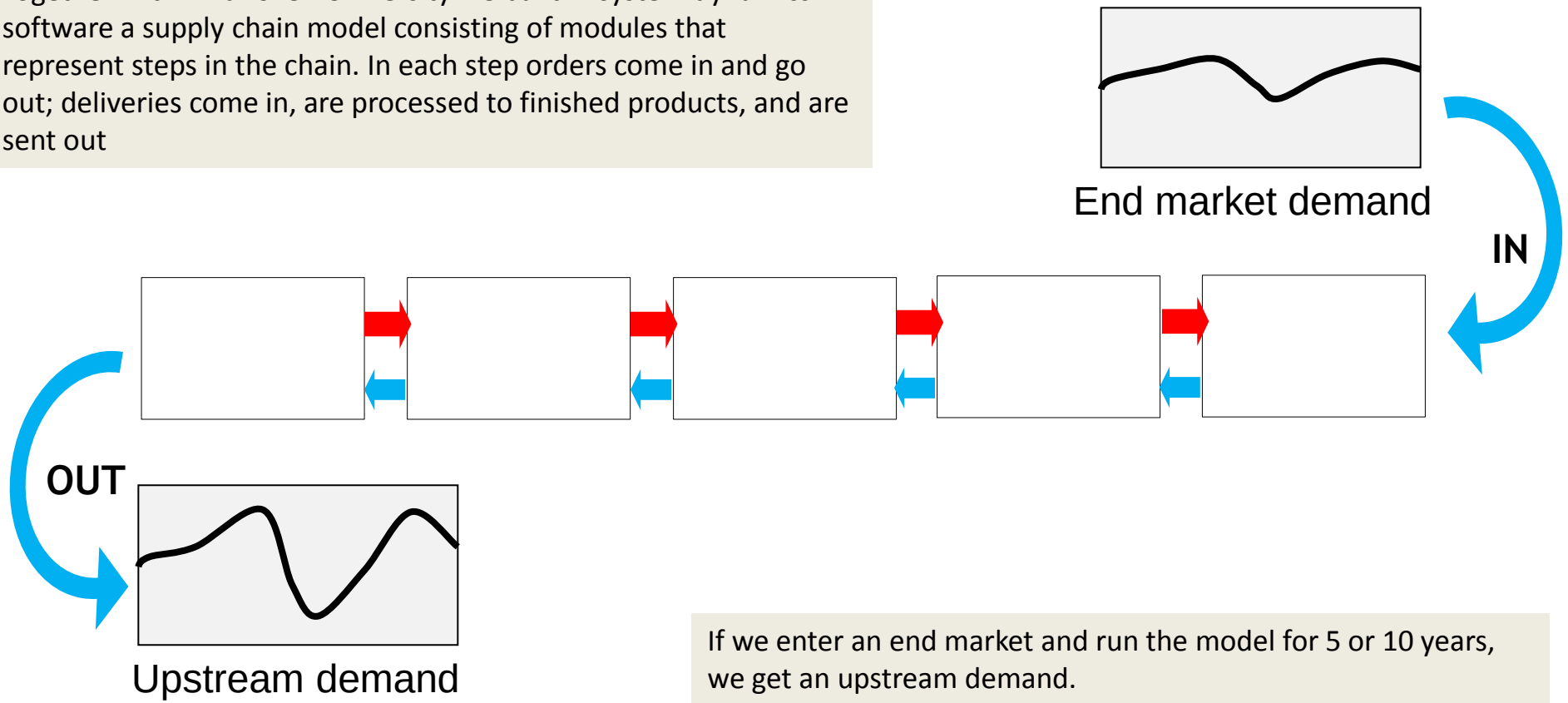
The end customer determines upstream sales. The chain in-between responds and buffers.

If we can capture the behavior of the supply chain in a computer model, we can translate the end market to upstream demand.

This audience already looks at key economic indicators for the end markets, as shown in the presentations of Jan van der Meulen of CEPE and Leif Darner of AkzoNobel. Challenge is to translate it.

Supply Chain Model

Together with Eindhoven University we built in system dynamics software a supply chain model consisting of modules that represent steps in the chain. In each step orders come in and go out; deliveries come in, are processed to finished products, and are sent out

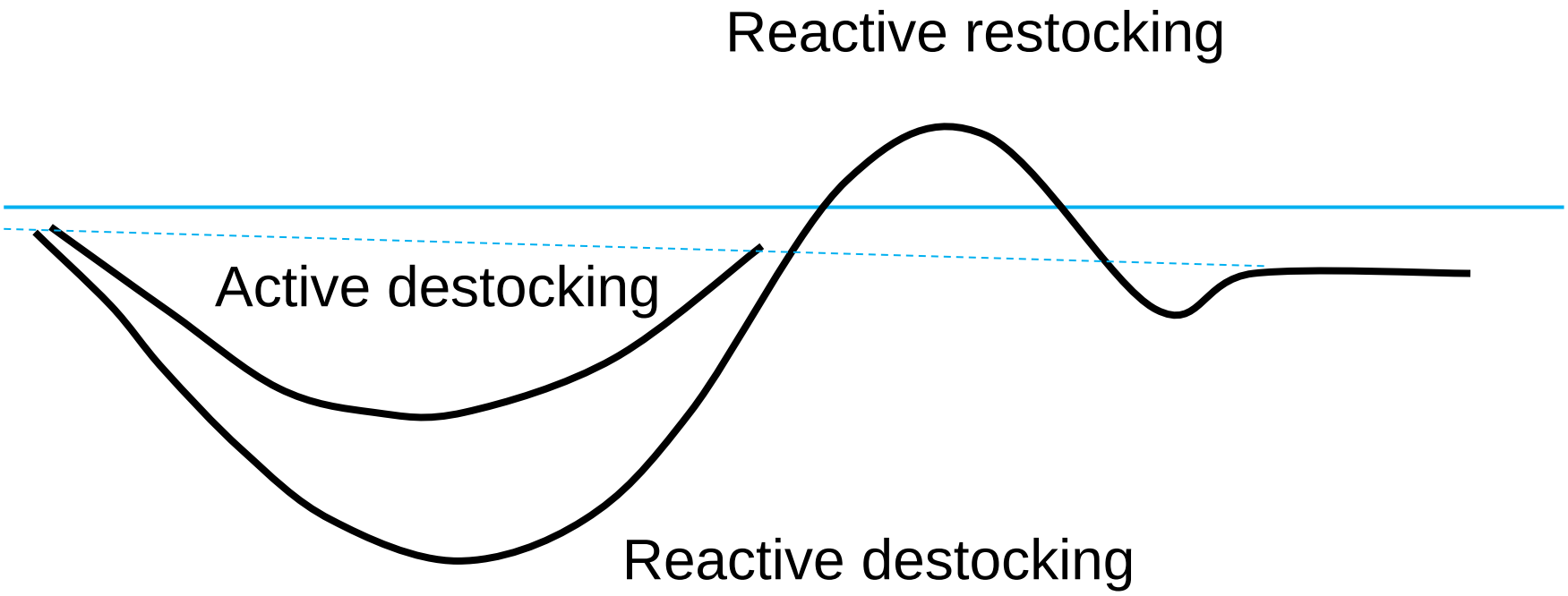


If we enter an end market and run the model for 5 or 10 years, we get an upstream demand.

Libor interest rate 2003 - 2010

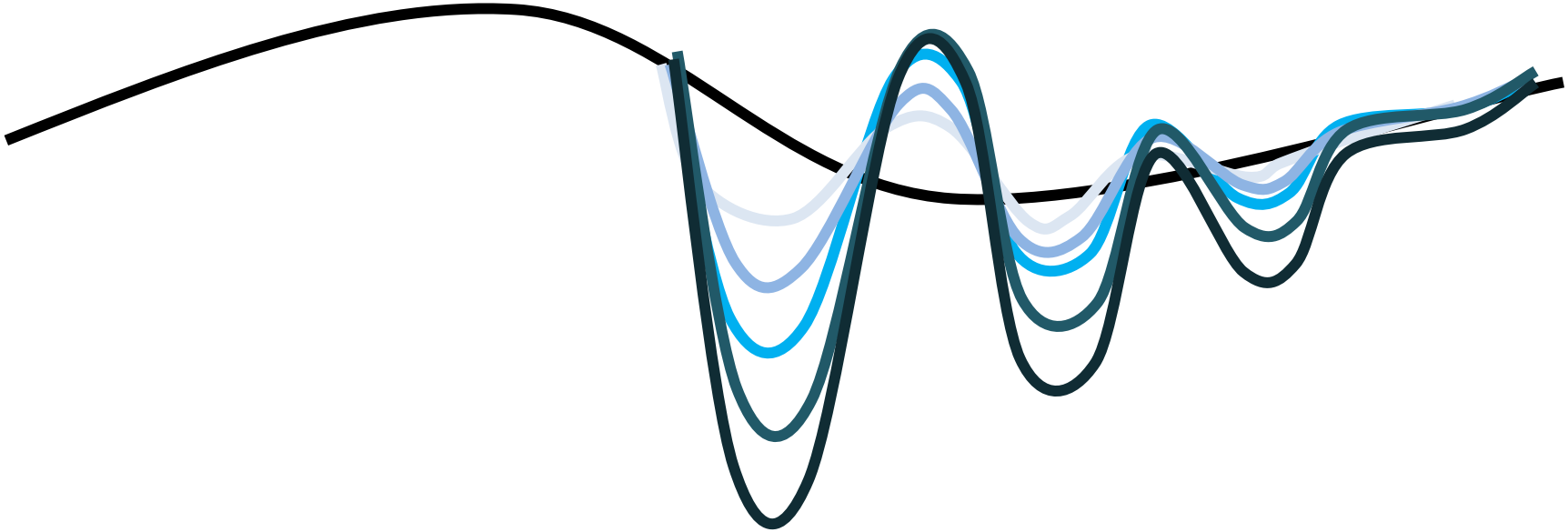
Lehmann Brothers failed in September 2008, causing the Libor interest rate to peak sharply.

This is an example of a trigger for behavior in the chain that needs to be included in the model. The Libor peaked after the bankruptcy of Lehman Brothers, all credit dissappeared overnight and all companies started to steer on cash. The only way to do that fast is by converting inventory into cash.



Credit squeeze triggered destocking

The conscious decision to reduce the stock/sales ratio resulted in what we call “Active destocking”. When suppliers experienced that as lower sales they responded with “Reactive de-stocking” to maintain their desired stock/sales ratio. When stock was gone, but end market ere still almost at the original level, stocks were too low and “Reactive restocking” had to take place to maintain the stock/sales ratio, resulting in an upward peak.



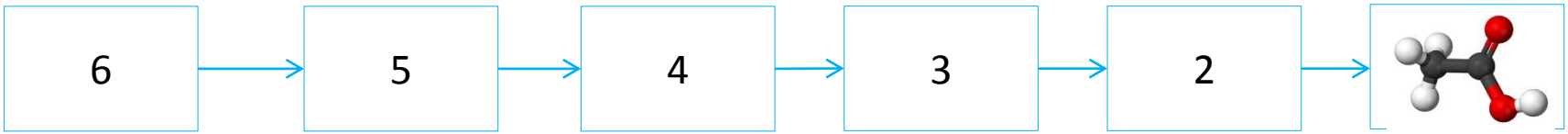
The “Lehman wave”

The amplitude of the Lehman wave depends, among other factors, on the stock depth relative to the end market. Each intermediate firm adds stock depth to the supply chain.

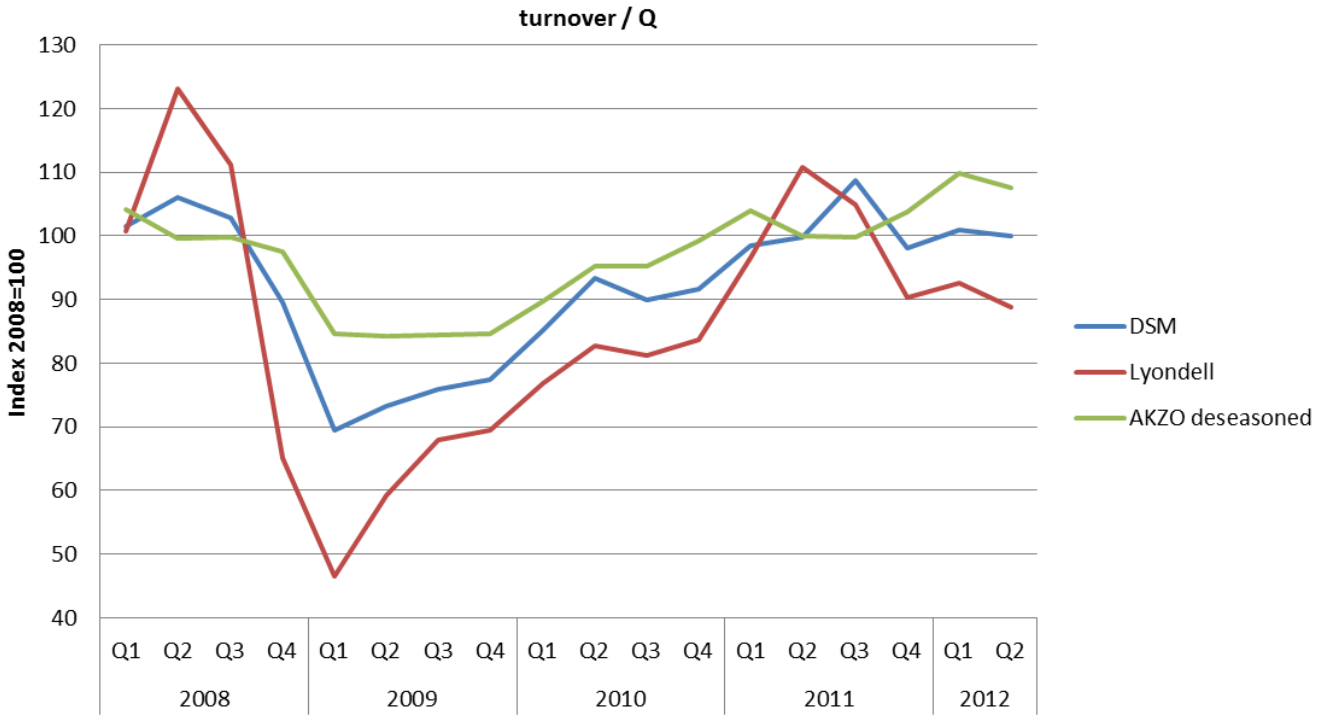
The destocking effects accumulated in the chain, resulting in a composite bullwhip that we have called “the Lehman Wave”. The wave was strongest for companies far away from the end markets.

Stock depth

- Company: over two months stock
- Supply chain: five to seven steps long
- Stock depth: over one year



This is a second principle I'd like to explain. "Stock depth" is the total sum of the sales coverage that exists in the chain. NB: coverage calculated in units, not money. It is also the time it takes a molecule to travel the whole length of the chain.



Stock depth example

Quarterly turnover data 2008-2012 for LyondellBasell, DSM & AkzoNobel.

Lyondell has a longer Stock depth than DSM, which has a longer one than AkzoNobel. The sales decline in the Lehman Wave was deeper for longer Stock depths.

Endorsements

Wharton
University of Pennsylvania

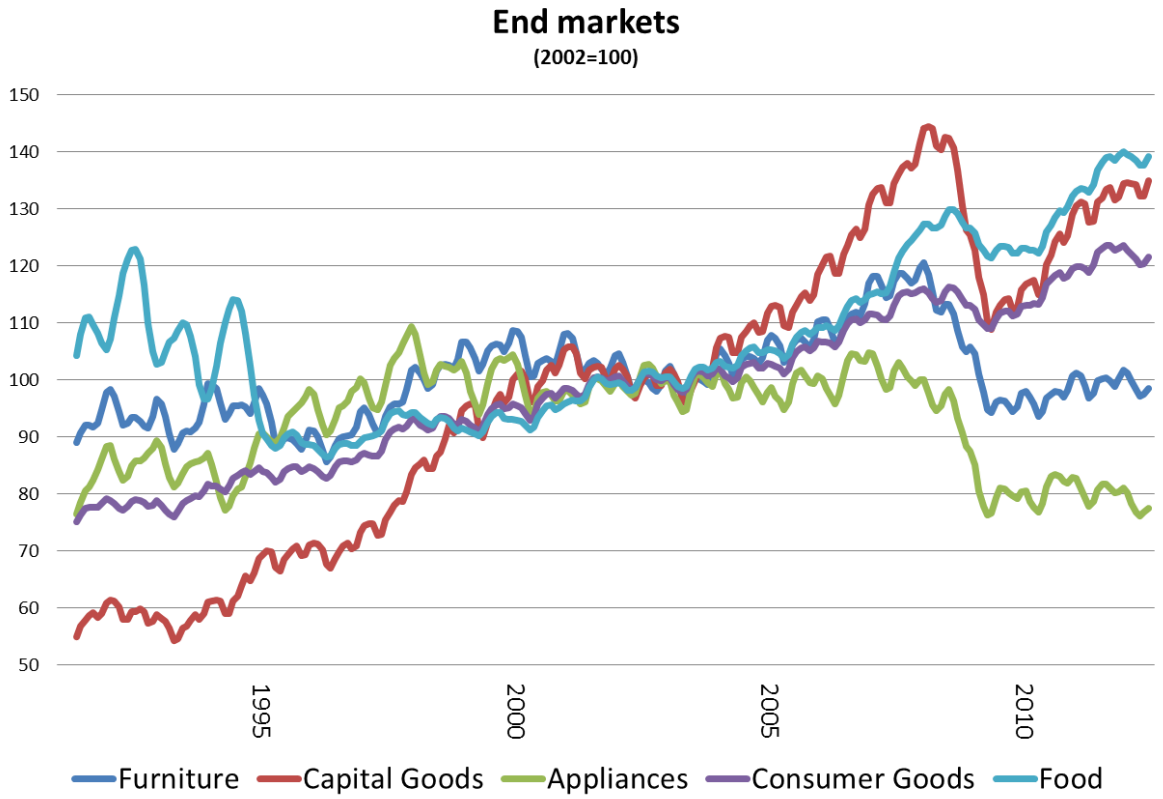
TU/e Technische Universiteit Eindhoven University of Technology

MIT Massachusetts Institute of Technology

Rabobank

The ideas behind Flostock have already been adopted by TUE/e, Wharton, MIT, ECB and Rabobank . The Dutch Central Bureau of Statistic (CBS) decided to start collecting inventory data after our presentation.

Examples



End market curves

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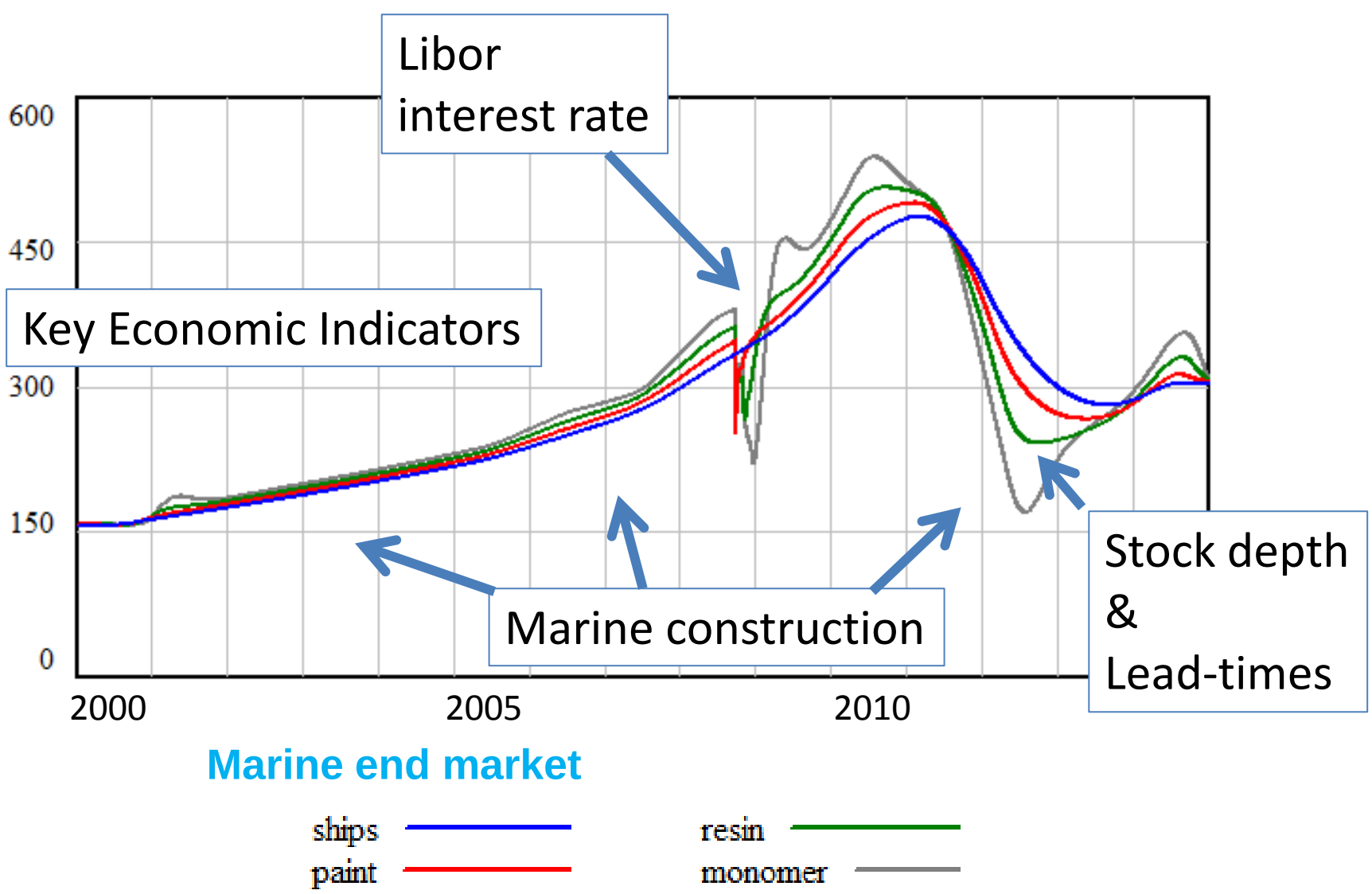
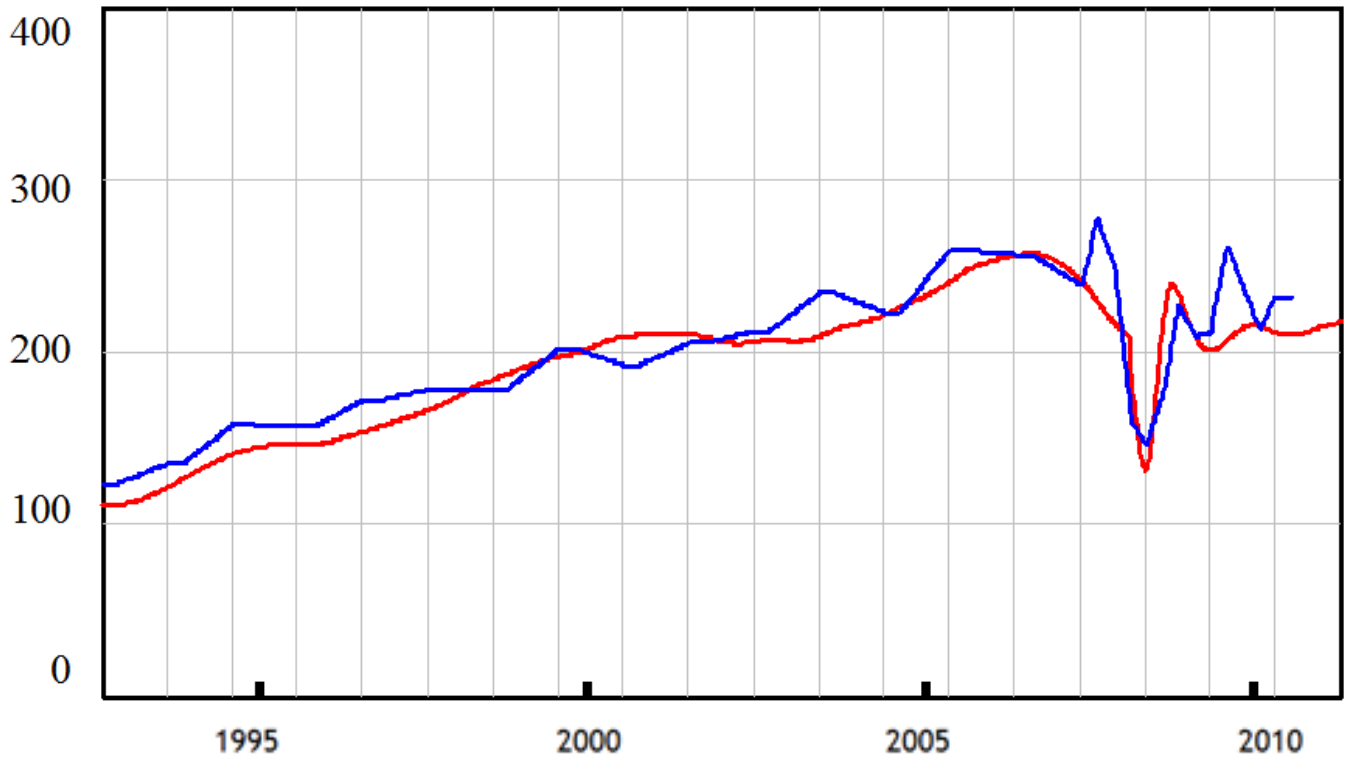
These are 5 random end markets as published by Eurostat, which show that –depending on where your products are going – your sales over the last 20 years must have looked completely different.



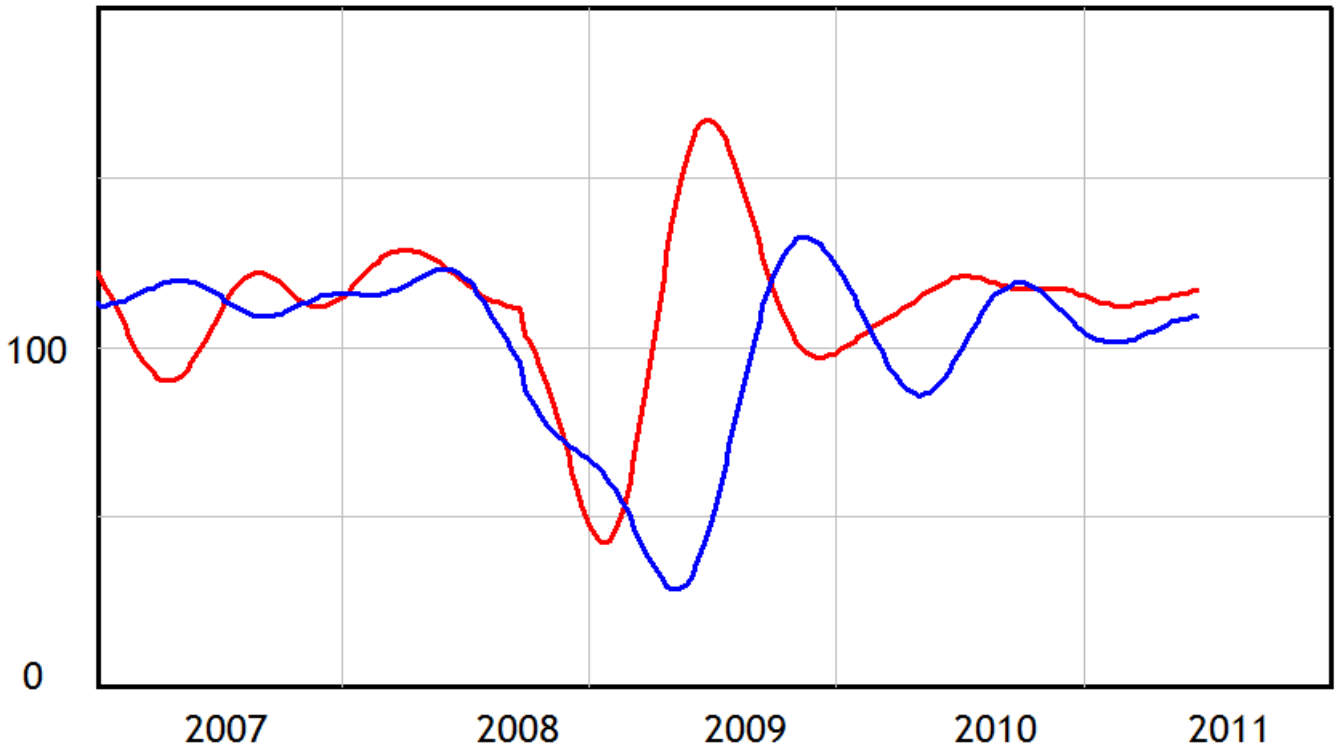
First example: Marine has an interesting pattern. When the Lehman Wave de-stocking dip in 2008/9 hit the supply chain, the industry was still growing due to the long lead times for shipbuilding. The overshoot continued and overcapacity was being created. A few years later it started to go down and paint and resin got a second dip, which will last a lot longer.



Coil paint

ECCA Paint ——— Model Paint ———

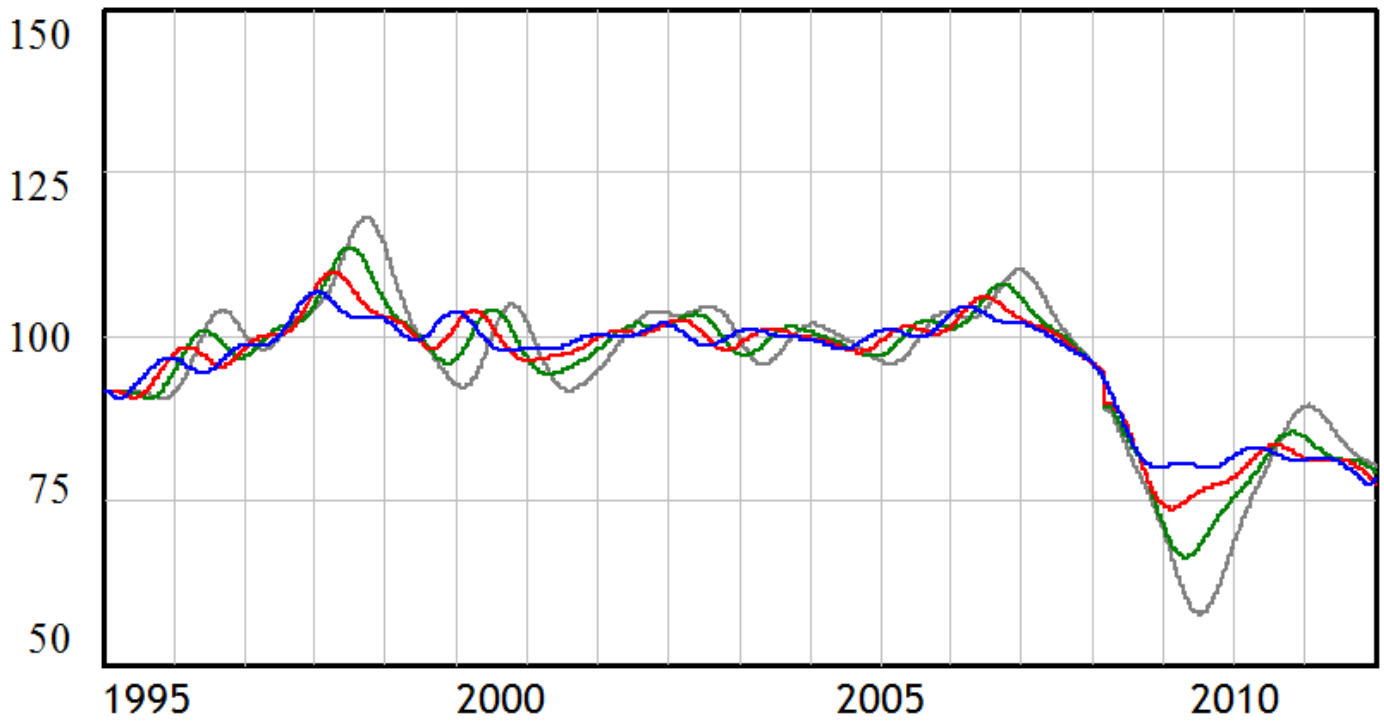
For Coil we can compare the model curve with the actuals as published by ECCA. (NB: ECCA is with seasonality, Model is without)



Can paint demand for food & industrial end markets

Food Industrial

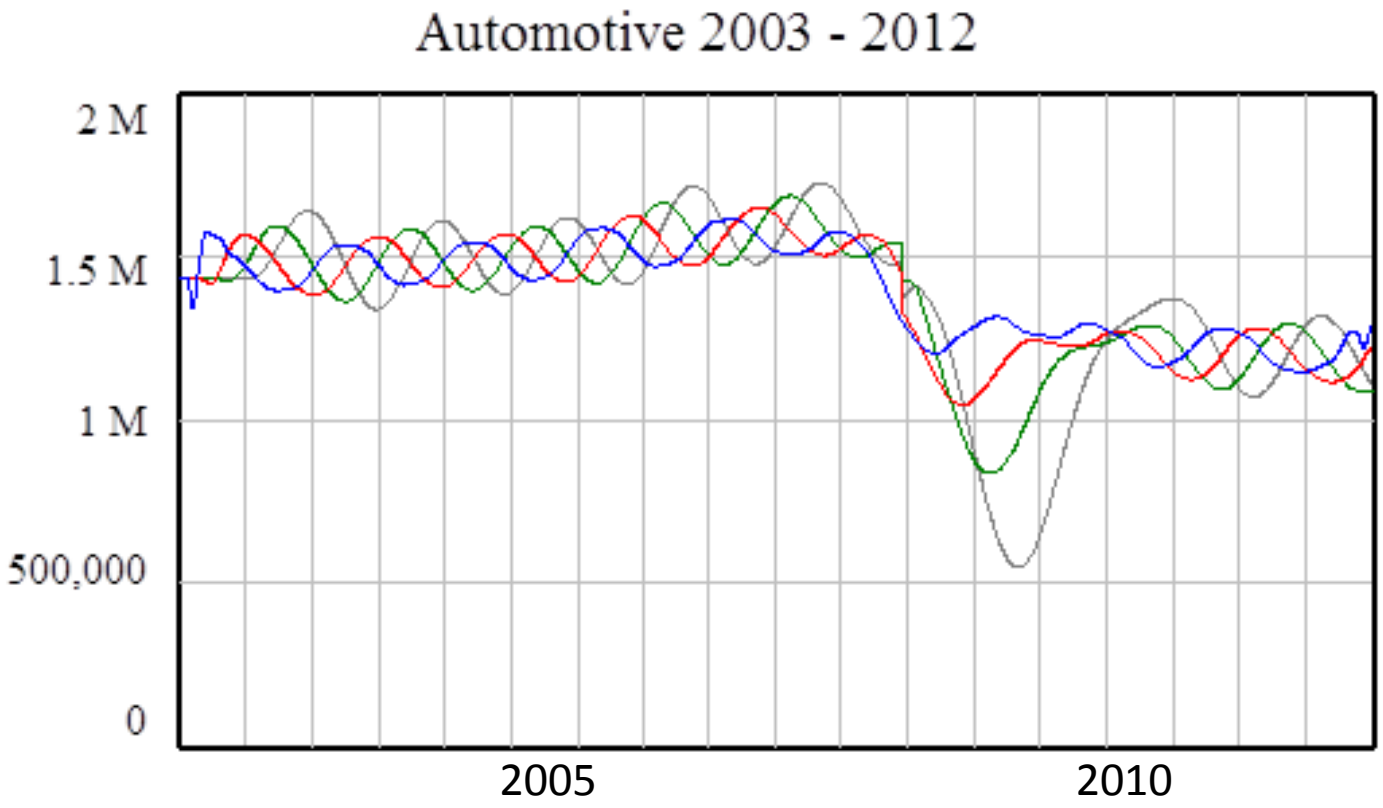
Can paint had a different curve for industrial applications than for food.



Appliances end market

appliances
paint
resin
monomer

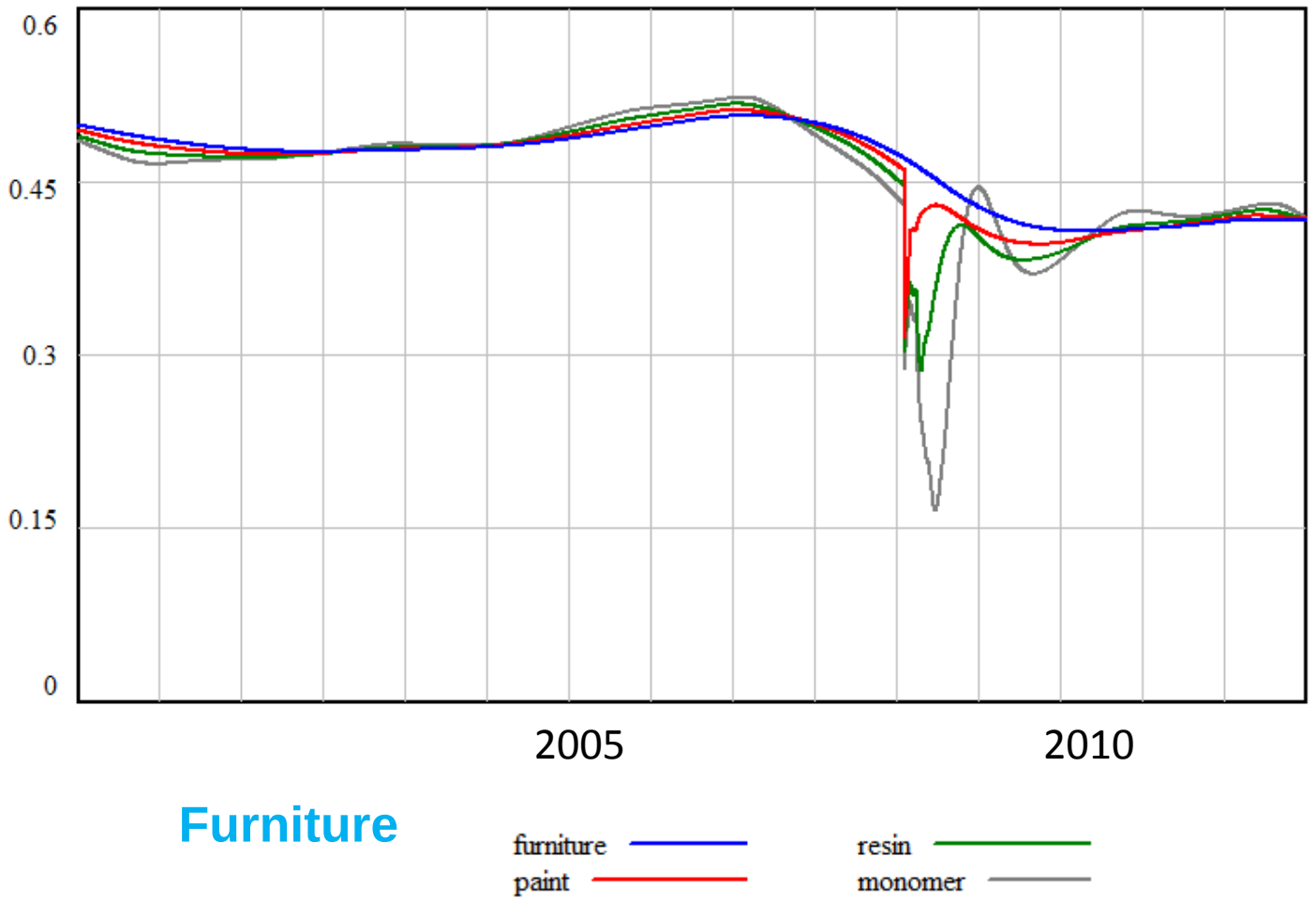
Appliances was flat for years; then it took a strong hit in the crisis and has not recovered since. Paint and raw materials had a stronger dip with some recovery, but ony temporary because it was reactive restocking. NB: these graphs were made by entering the Eurostat end market curve into a standard Flostock model, only for demo purposes.



Automotive end market

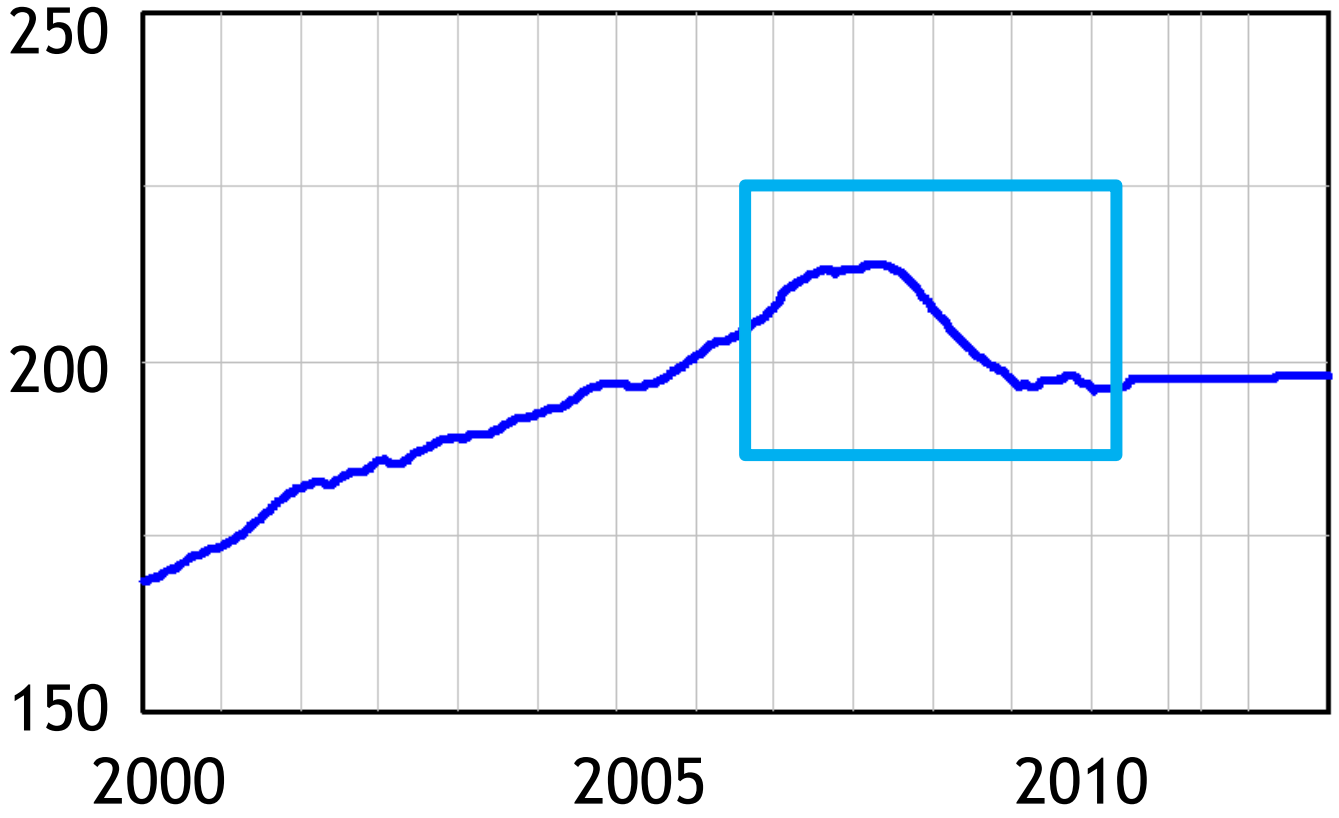
automobiles
paint
resin
monomer

Automotive created a strong wave, also due to the stimulation packages in various countries. (By the way: We expect that this will recover soon, as the total fleet in Europe has not changed and the average age will go back to previous optimum.)



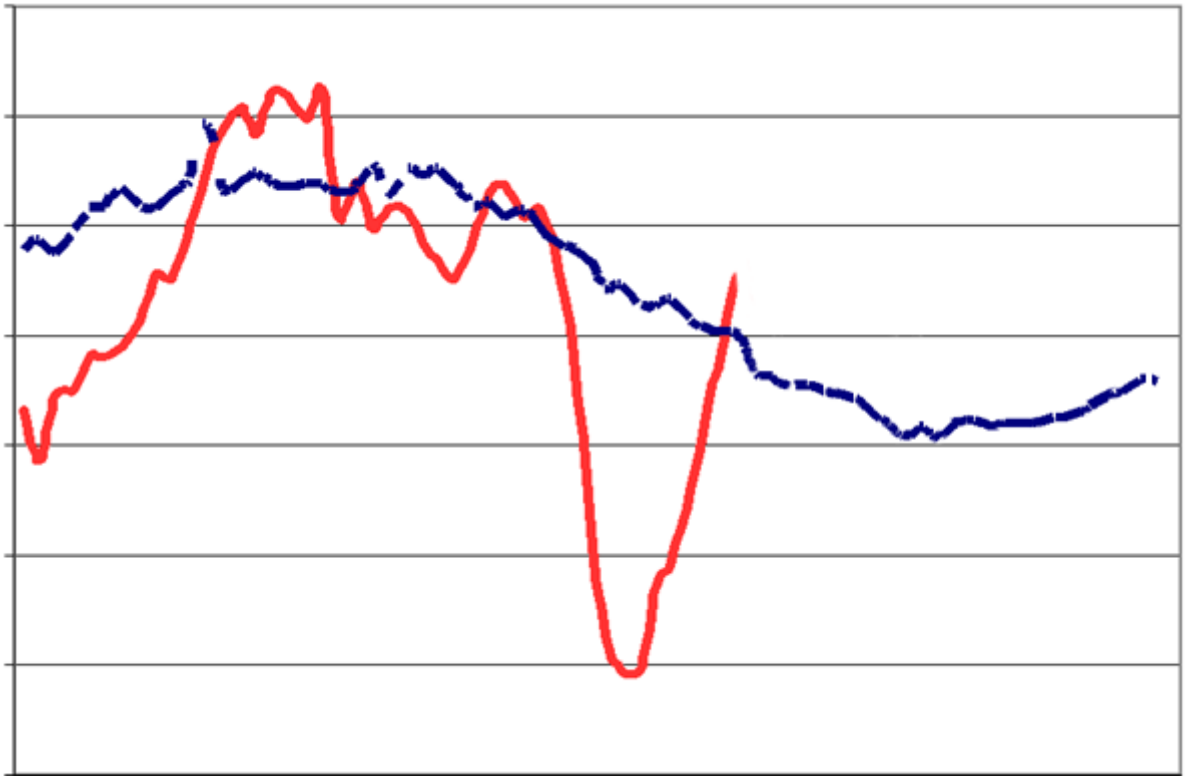
Furniture

Furniture started already going down in 2007, with construction. In the decline the Lehman Wave hit.
(NB: this curve is a bit different from paint segment Industrial Wood, because that goes into multiple markets.)



Construction end market

Source of this graph is Euroconstruct, not Eurostat. Euroconstruct has the big advantage that they also give a quite reliable two year forecast and detailed data per segment. Warmly recommended.

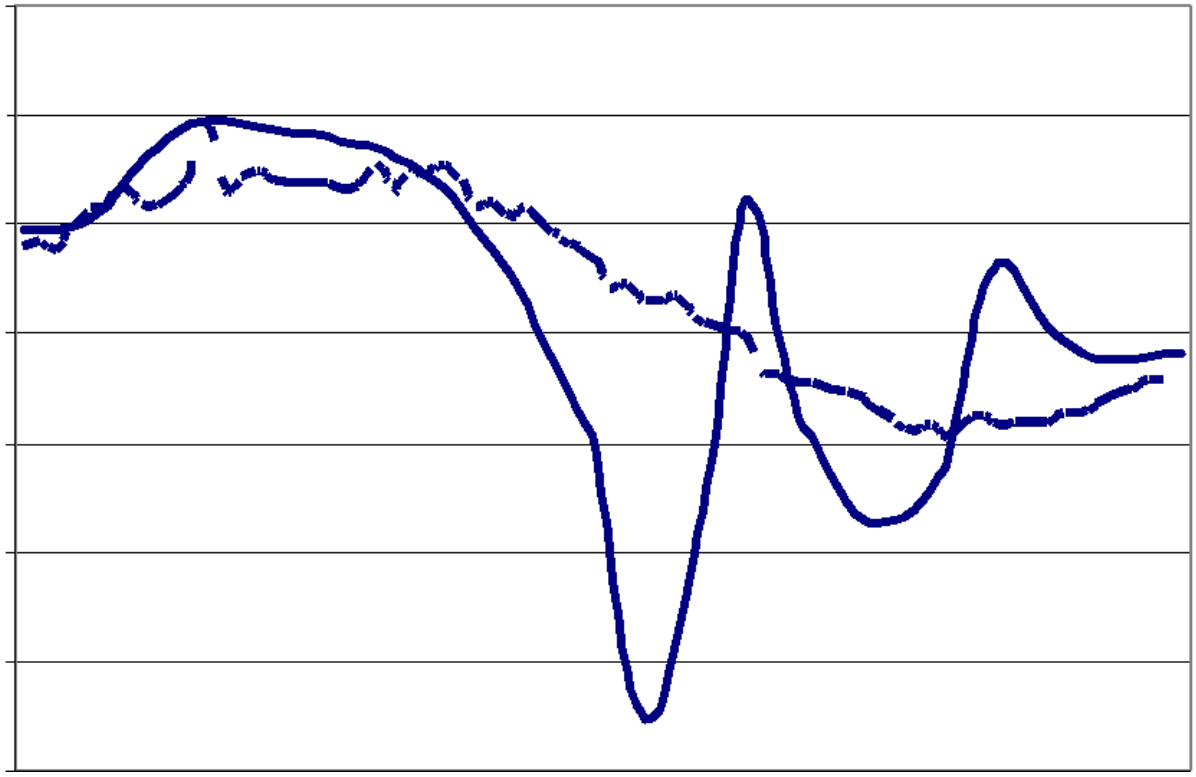


Construction end market

Construction

Actual sales DSM

This illustrates that a key economic indicator alone does not explain a company's sales. In this case Joinery resins from DSM.

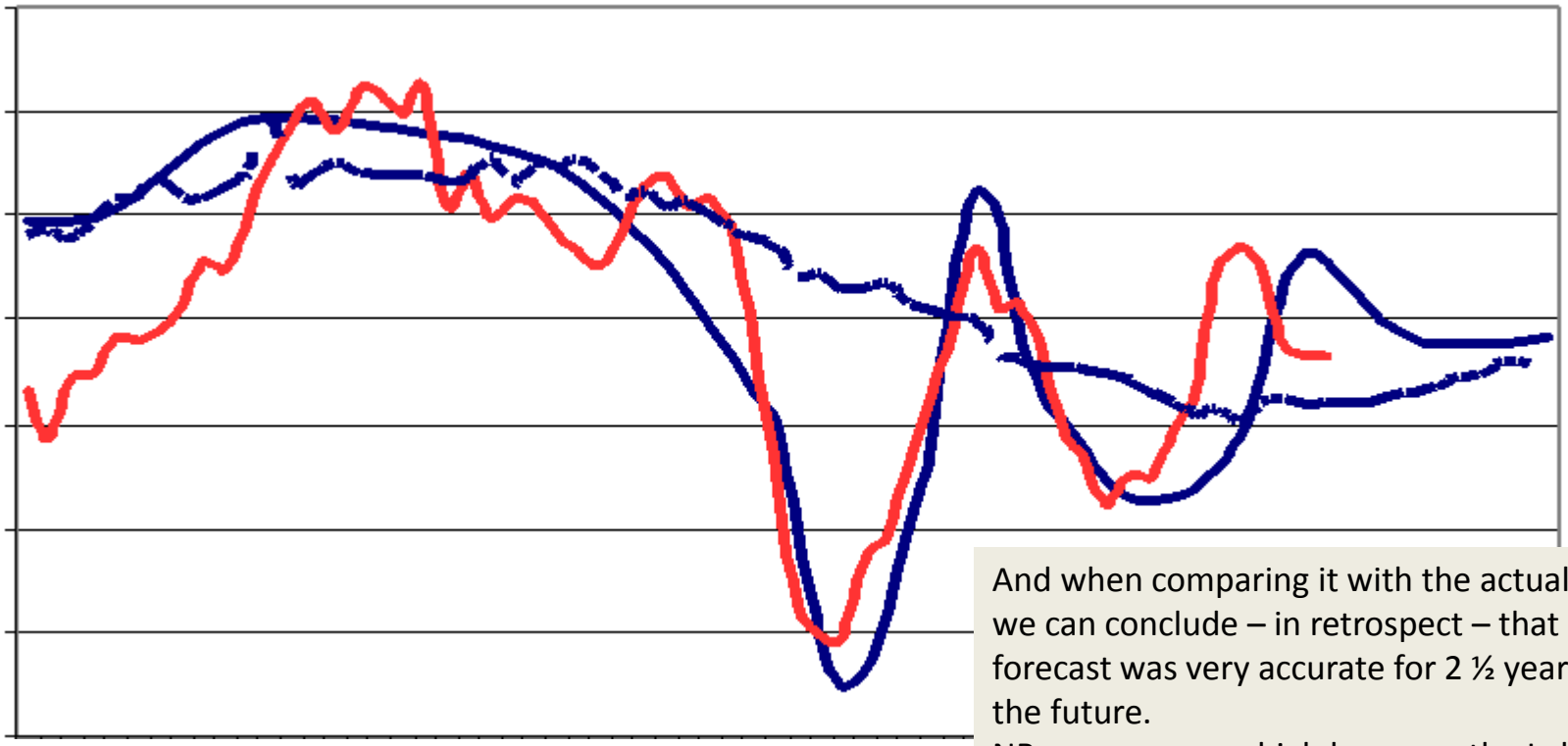


Construction end market

Construction

Model sales

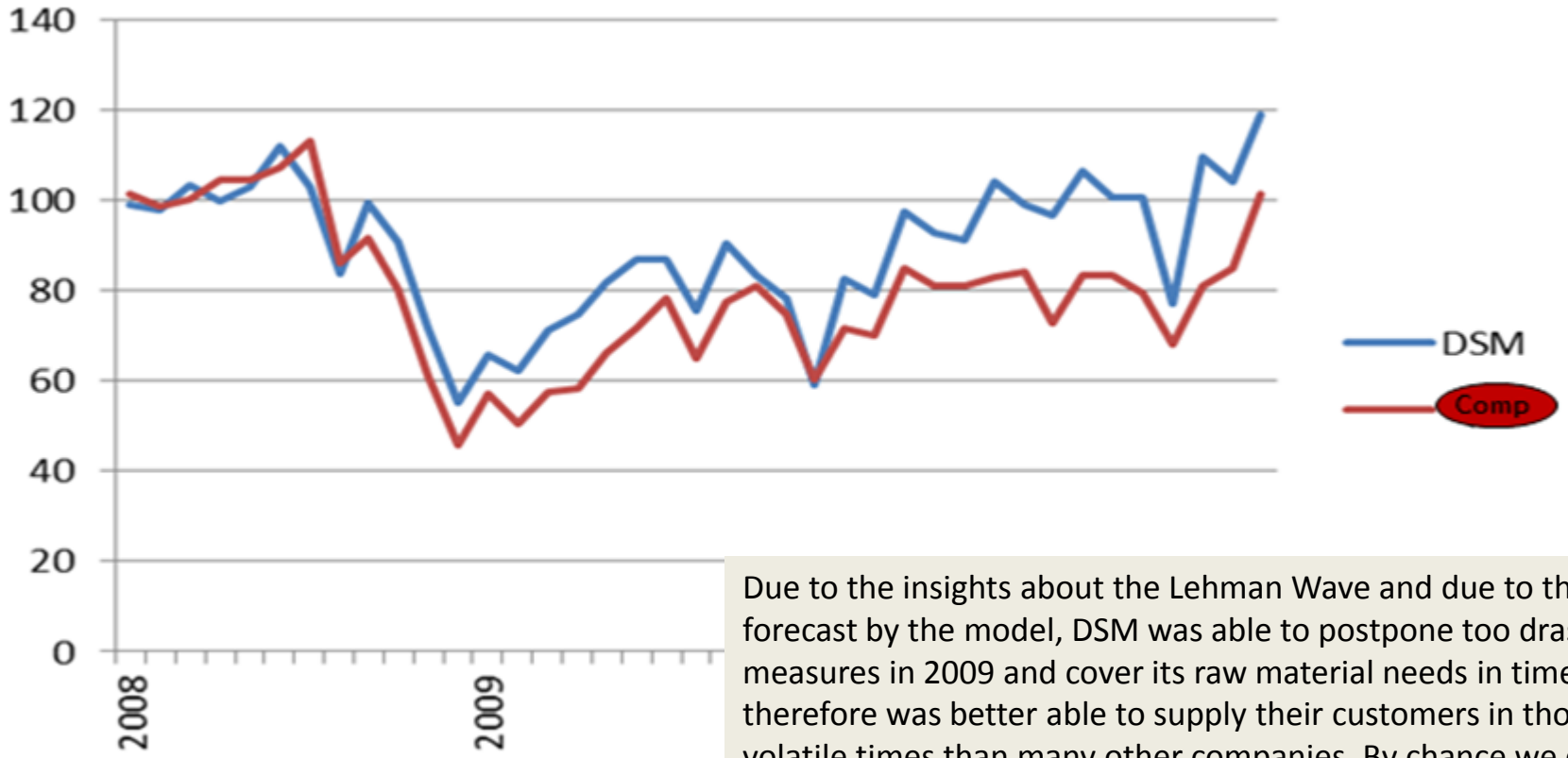
Entering the Euroconstruct curve and the Lehman Wave de-stocking into the model, we created this model sales forecast graph in September 2009.



Construction end market

- Construction
- Model sales
- Actual sales DSM

And when comparing it with the actual sales we can conclude – in retrospect – that the forecast was very accurate for 2 ½ years into the future.
NB: accuracy was high because the Lehman Wave was very dominant in that period. There is no guarantee that the same accuracy can be achieved in all cases.

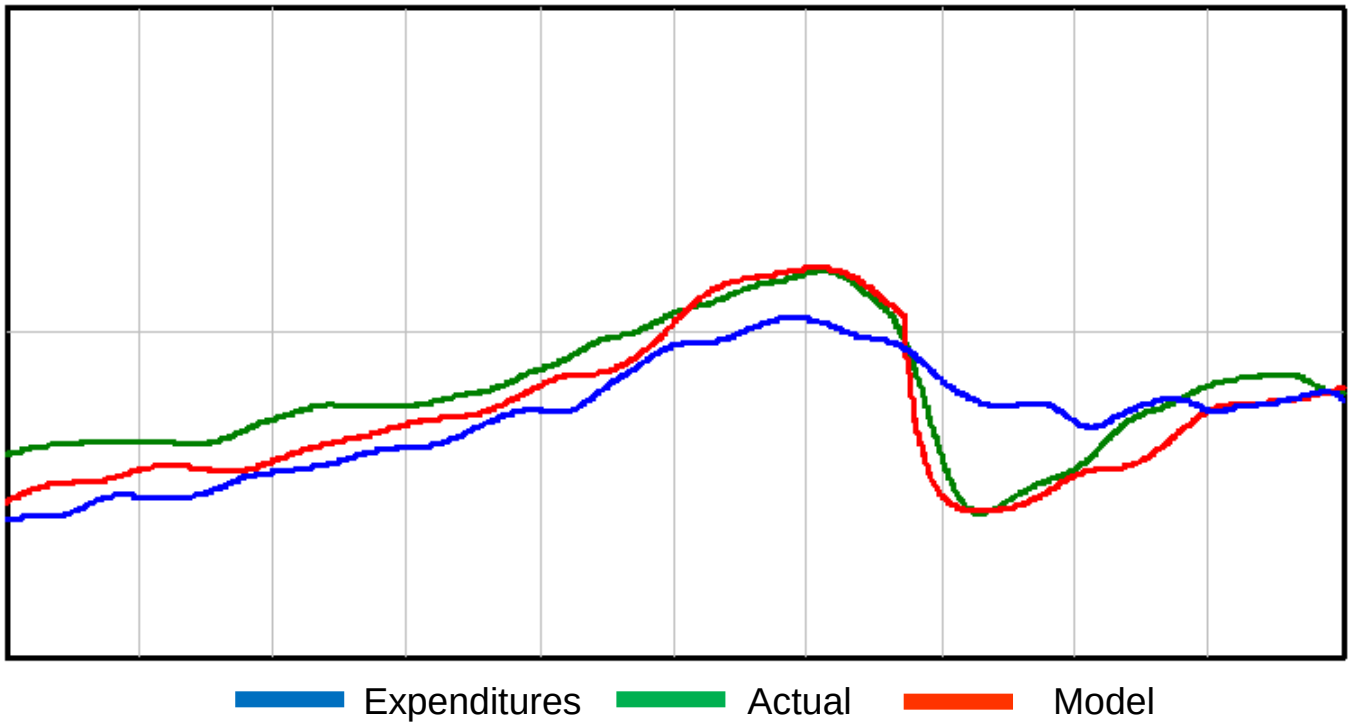


DSM Benefits

15 % market share

€ 250 mio turnover

Due to the insights about the Lehman Wave and due to the forecast by the model, DSM was able to postpone too drastic measures in 2009 and cover its raw material needs in time and therefore was better able to supply their customers in those volatile times than many other companies. By chance we can compare the turnover with a direct competitor, who did take harsh measures early and could not supply, which may have resulted in a 15% MS gain for DSM. These results were published by Flostock and DSM in the ECJ of October 2011.



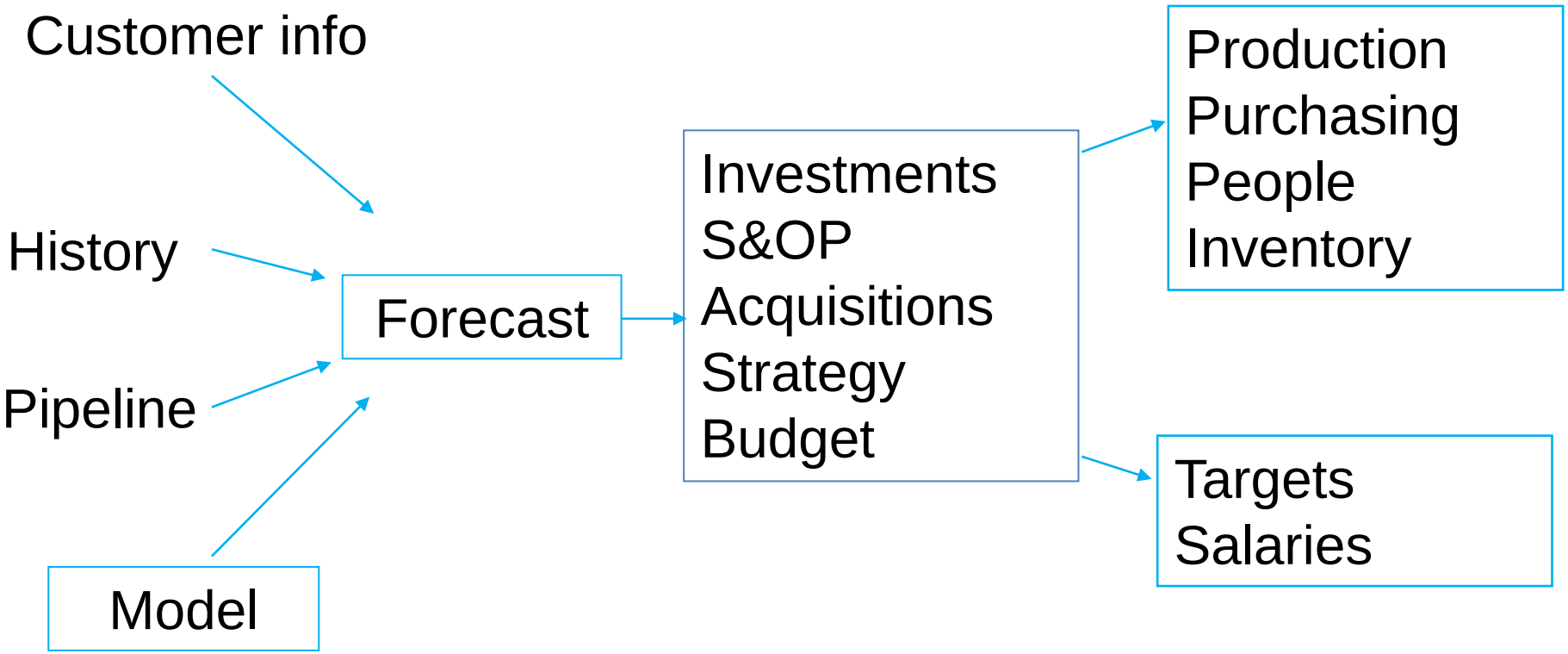
Industrial production

End market for Europe's Industrial production is expenditures in retail, construction, capital goods, government and export minus import.

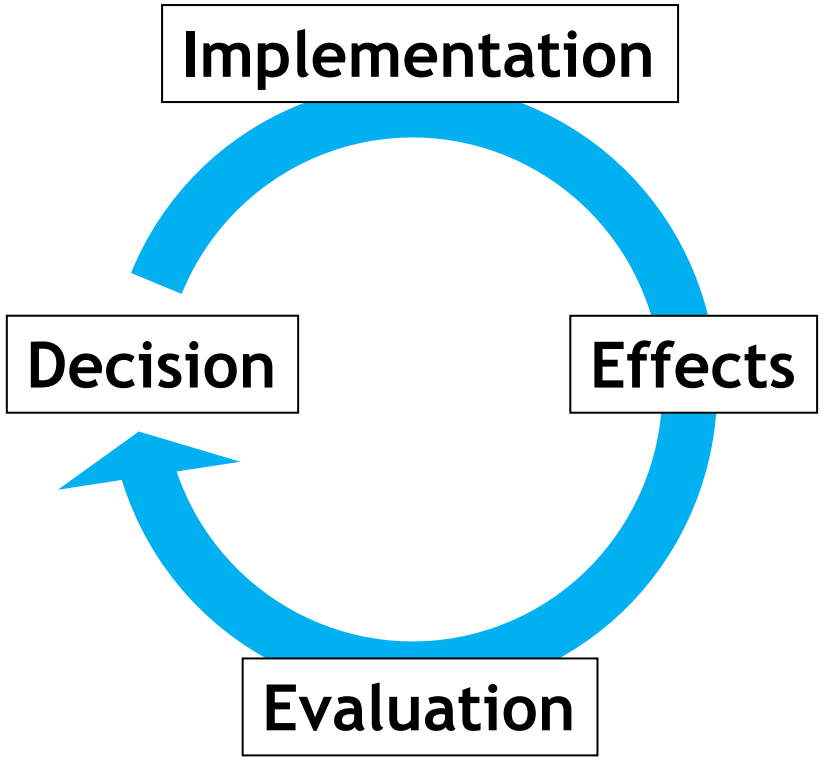
A last example to show that the model can also be used for whole countries or regions: Here we entered the expenditures in Europe into a model and were able to create a surprisingly good match with overall Industrial Production. A publication is in preparation.

Applications of modeling

Purpose: sales forecasting

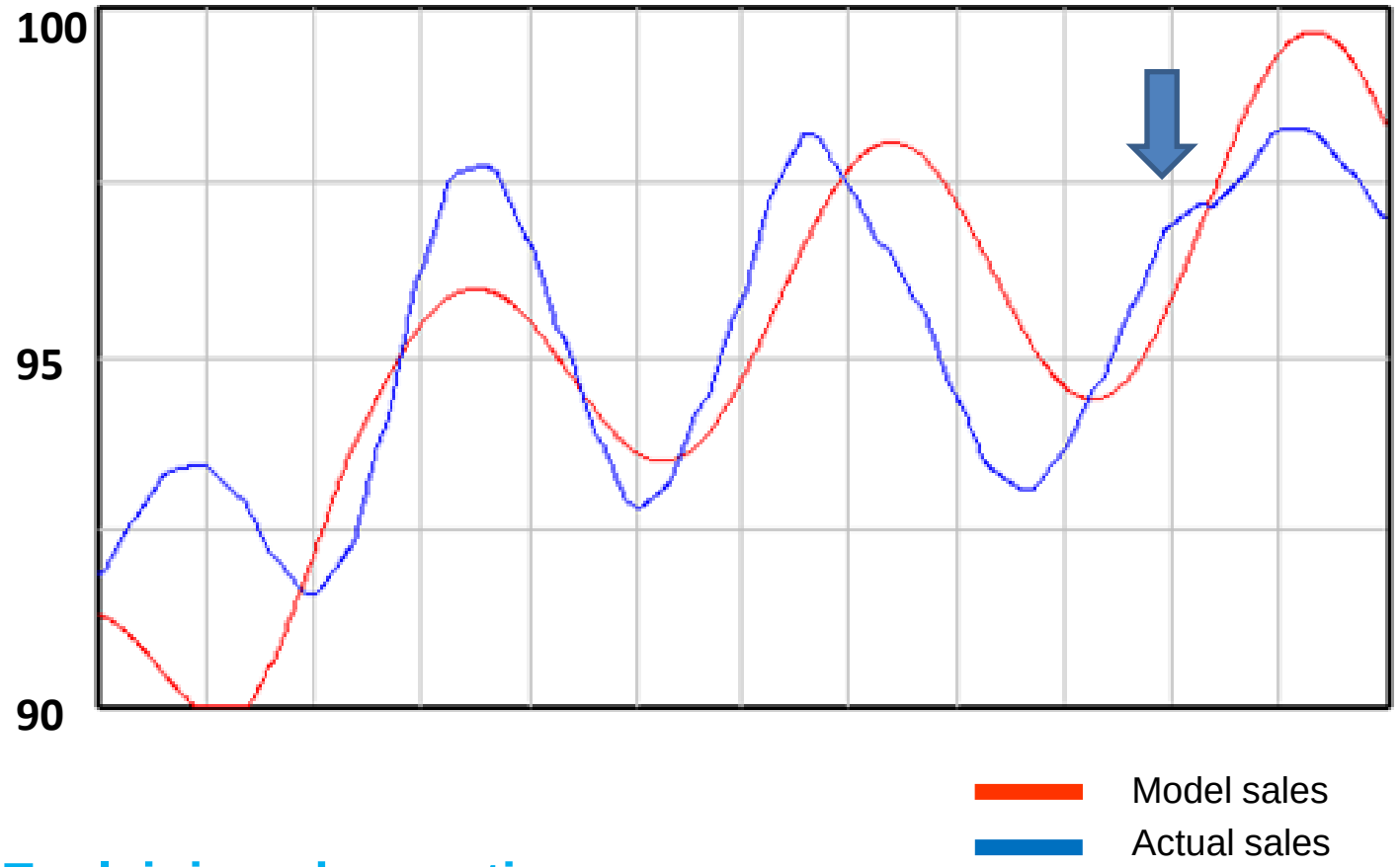


Sales Forecasting is central for many activities in a company, and many companies struggle with it. The model forecast should be seen as a fourth, fact based, pillar under the sales forecast, but it ultimately remains a business decision.



Scenario analysis and strategy evaluation

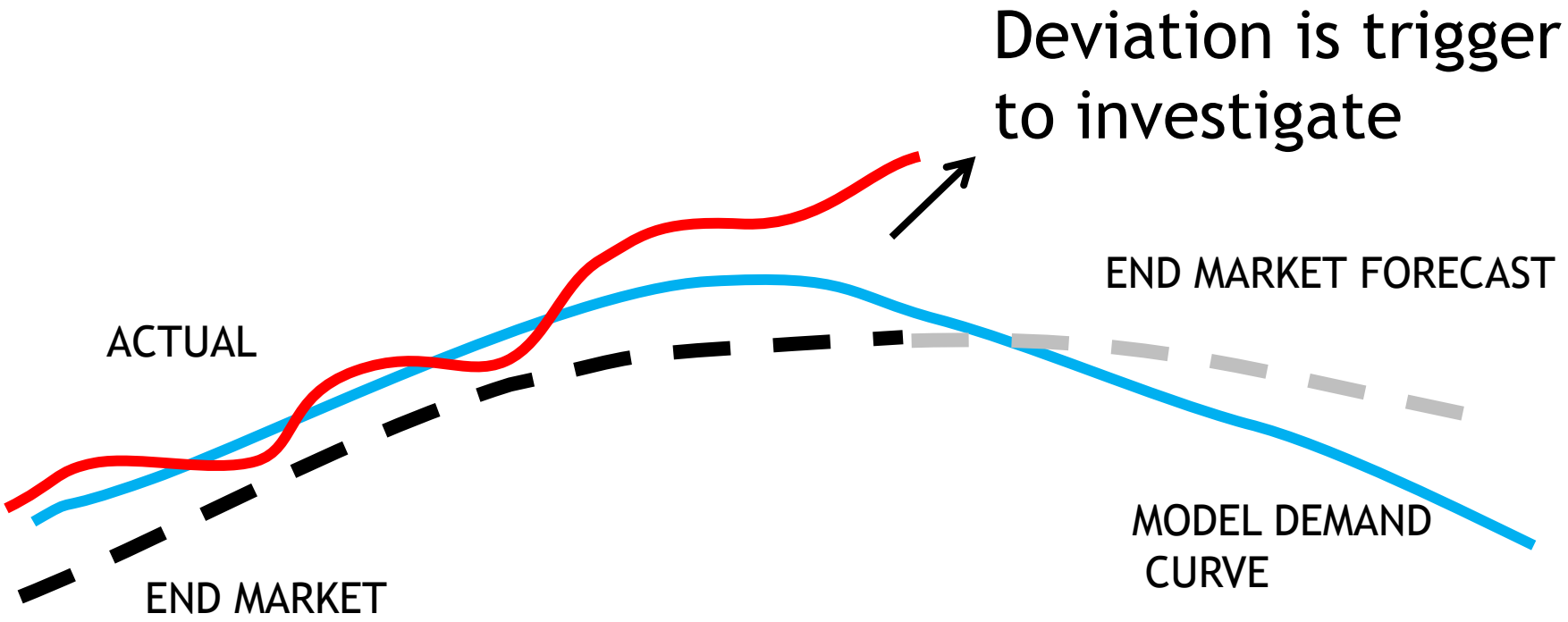
The models can also be used for testing scenarios and strategies and give the possibility to compare the supply chain consequences of various decisions.



Explaining observations

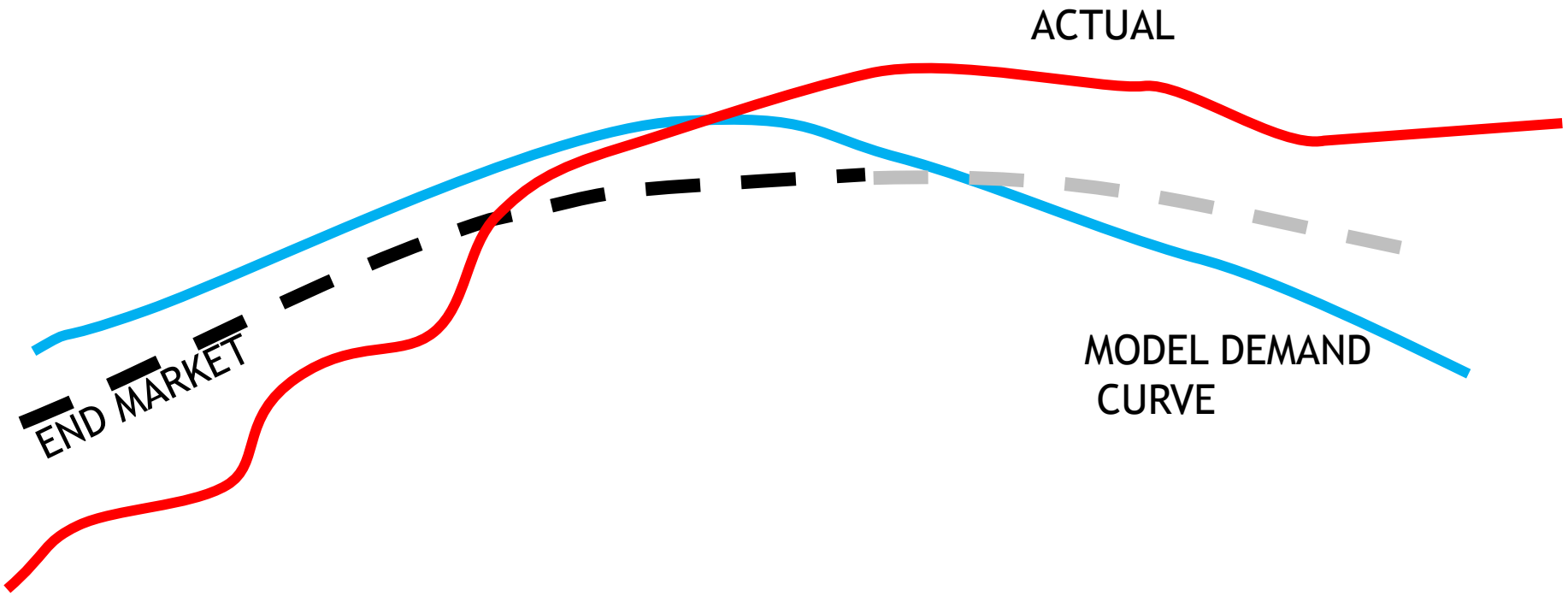
Seasonality in the end market as cause for upstream cyclicity.

In this example a customers observed a strong annual oscillation after she expanded her capacity. We were able to show that a slight seasonal effect in her end market had become visible now the industry was no longer capacity constrained.



Explaining observations

If the Actual sales starts to deviate significantly from the Model forecast, it should trigger an investigation into the cause. This could include a competitor with a capacity problem, a price increase, a new application in the end market, etc..



Explaining observations

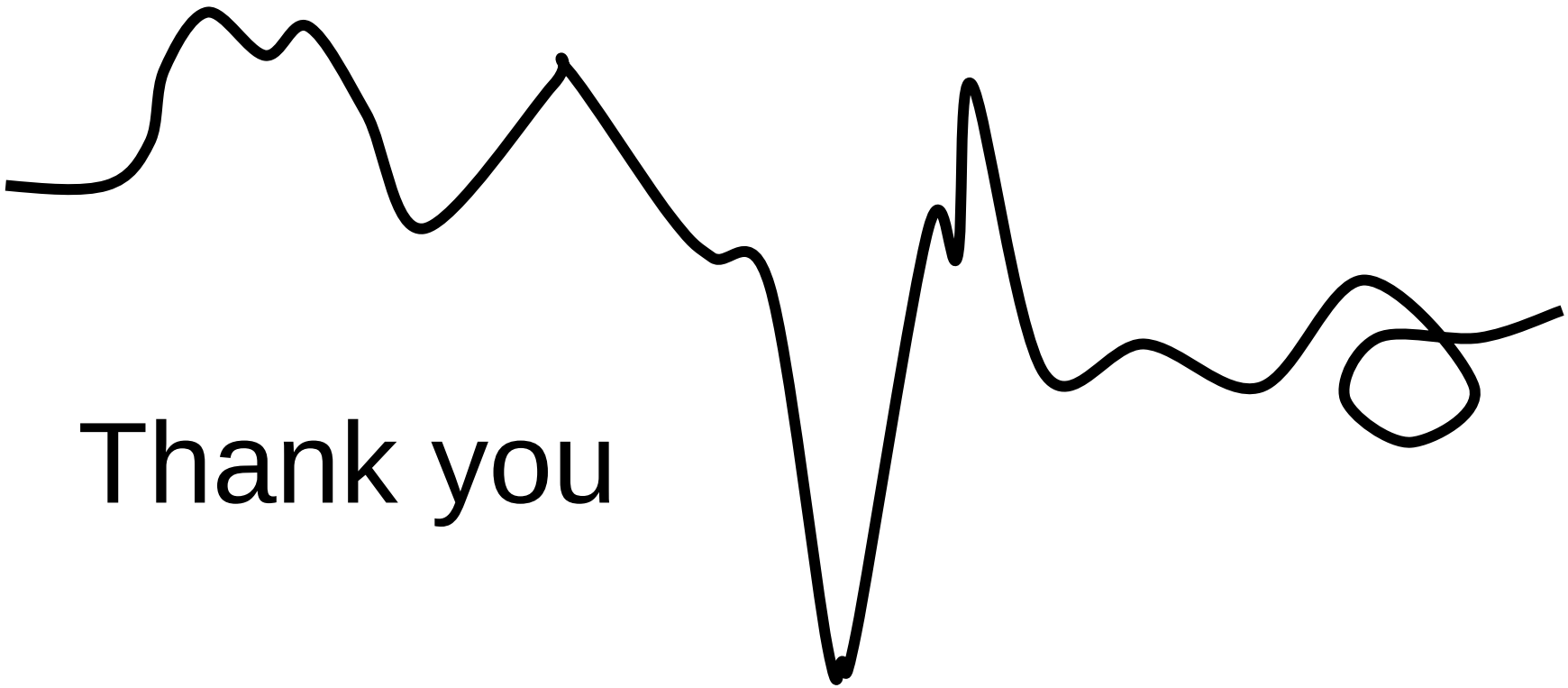
Calculate market share developments and penetration.

If your Actual Sales deviates consistently positive from the mdoel curve, you may be going through a penetration curve. The model can calculate its shape, and since most penetrations follow a similar path, its extrapolation can be entered in the model to improve the sales forecast.

Conclusions

- End markets determine demand
- Paint goes into very different end markets
- Stock depth is long.
- Flostock's supply chain models translate key indicators of end markets into upstream demand, taking lead time & stock depth, MS & Penetration into account.

Flostock is still a small company, a start-up from 2011, but last month I hired my first full time employee, a cum laude graduate from Eindhoven University of Technology. We are the only one in the world doing what we do, but I expect that not for long other companies will follow. I believe that within 5 or 10 years it will be as common to have a supply chain analysis tool as it is now to have an ERP system.



Thank you

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We predict what you promise…