Volatility and uncertainty in seaports:

Tools and strategies towards greater flexibility, resilience and agility of port authorities and port companies

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- Didier Keters, Sector Principle Utilities, transport and logistics
- Bram Debruyne, manager Business Desk haven
- Presentation 18 December 2013
Agenda

• Study: How can port authorities and port companies deal with uncertainty and volatility in the market?

• ING’s Sector approach

• Financial hedging tools: hedge interest rates, currency rates and commodity prices
ING Sector Approach – Transport & Logistics

Dedicated team of experts at ING Belgium

• Didier Keters - Sector Principal Transport & Logistics
• Bram Debruyne - Business Desk Manager Antwerpen Haven
Sector T&L – definition

- Companies whose primary business function is to generate revenues and profits derived from the movement of passengers and or freight

- Companies whose primary business is directly related to the above business, f.e. freight forwarding, logistics services and captive (in-house T&L) companies
Number four of series

Authors: Indra Vonck and Theo Notteboom (ITMMA, University of Antwerp, www.itmma.ua.ac.be)

For further information on the services of ING Bank in transport and logistics, please visit www.ing.be
1 | Analysis of volatility and vulnerability of port operations

2 | Resilience and flexibility framework

3 | Application to current issues in ports

4 | Conclusions and recommendations
1. Volatility and uncertainty: the importance of ports being prepared

The growth in uncertainty linked with the strategic importance of ports ushers a new era of risk management and resilient thinking.
Market volatility and uncertainty

• We live in a volatile world full of uncertainty;

• Uncertainty is not a new phenomenon but the related intensity seems to be changing;

• Uncertainty affects the market sentiment (i.e. the average mood in the market) and leads to biased behavior;

• Market volatility has exogenous (e.g. economic cycles) and endogenous causes: market players add significantly to the volatility of their business environment through their own investment and allocation decisions.

• Adaptation vs. mitigation
Market sentiment gauges

Source: CNN money

European confidence index

Source: European commission services
Indexes on volatility in the financial markets

VIX index with average values

- Blue: VIX close
- Orange: Long avg
- Gray: avg '04-'07
- Green: avg '07-'10
- Green: avg 10'-13'

Indexes on volatility in the financial markets
Global uncertainty reaches a new level

Major disruptions in the last decade
Risk in the maritime trade

Supply chain induced uncertainty

- **Macro environment risks**: a wide range of external forces that affect the entire business and supply chain.

- **Extended value chain risks**: extend around a company’s upstream and downstream supply chain partners.

- **Operational risks**: tied to a company’s internal product development, manufacturing, and distribution operations.

- **Functional risks**: relate to the business functions that support supply chain activities, such as Finance, Human Resources, Legal and Information Technology.
Risk in the maritime trade

Macroeconomic and supply chain uncertainty surrounding ports

• **Patterns in global economic development**

  The last three decades have seen important modifications in international trade flows. The bulk of international trade occurs within economic blocs, especially the European Union and NAFTA.

  The world economy is increasingly influenced by developing countries and economies in transition.

  Shifts in spending power and economic strength pose a constant threat to ports and industry leaders affecting cheap labour conditions, trade hotspots and maritime flows.

• **This threat can be reformed to an opportunity:** Managing trade in developing economies

<table>
<thead>
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<th>GDP growth %</th>
<th>2004</th>
<th>2005</th>
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Risk in the maritime trade

Macroeconomic and supply chain uncertainty surrounding ports

• **Change in logistics networks**
  
  The classic view on supply chain engineering was very linear. In recent years, logistics networks have become far more complex.

  • Many options for distribution network, companies have an abundance of choice: EDC, RDC, NDC, Hybrid

  • In combination with uncertain GDP growth this creates a challenge to locate the best locations for these centers.

  • The effects of nearshoring add to this shift and increase the pressure on the local EDCs

  • A way in which to reduce this uncertainty is betting on top locations

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**Dynamics in the configuration of logistics networks in Europe**

- Distribution based on RDCs
- Distribution based on one EDC
- Distribution based on tiered system (EDC+RDCs)

**Towards a new wave in logistics networks?**

- Networked EDC
- Less VALS in EDC
- DC bypass
- Twin/triple EDC system
Risk in the maritime trade

Macroeconomic and supply chain uncertainty surrounding ports

- Change and flexibility in cargo routing
- Corridors have become the main arteries of world trade.
- The new Panama canal locks increasing capacity and the monopoly of the Suez canal offer both opportunities and threats.
- Further shifts can be expected amongst South-South routes and traffic through Arctic waters.
- A way in which to reduce this uncertainty is flexible cargo routing (impact on port choice?)
## Uncertainty and risk behaviour in ports

A typology of risks in ports

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>Type</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical</td>
<td>Internal</td>
<td>Construction and technology</td>
</tr>
<tr>
<td>Market</td>
<td>External</td>
<td>Gross domestic product, growth, inflation, market structures, changes in supply chain management practices.</td>
</tr>
<tr>
<td></td>
<td>Internal</td>
<td>Business models (e.g. concentration/specialization risk), traffic demand, elasticity, pricing and capacity strategies of rivals and on alternative routes, energy cost risks</td>
</tr>
<tr>
<td>Financial</td>
<td>External</td>
<td>Interest rate, taxation currency, exchange rates, debt rating of the country, payment risk (customer base).</td>
</tr>
<tr>
<td></td>
<td>Internal</td>
<td>Capital risk (including loans availability and interest rates, revenues, payback period, grant financing)</td>
</tr>
<tr>
<td>Political</td>
<td>External</td>
<td>Legal, Regulatory, Security, moral hazard</td>
</tr>
<tr>
<td>Environmental</td>
<td>External</td>
<td>Changes of environmental laws, unforeseen societal sensitivities</td>
</tr>
</tbody>
</table>

Source: based on Rodrigue, Notteboom and Pallis (2011)
The potential impact of a port failure

**Quantifiable impact**

- In 2012, the workers employed in the Belgian ports represented around 2.6% of Belgian domestic employment.
- Around 4.29% of the BNP of Belgium came from direct value added activities of Flemish ports.*

*Based on the figures of the National Bank of Belgium

**Strategic impact**

- The strategic importance of seaports as key infrastructures and guarantors of accessibility
- E.G. the strategic value of the port of Rotterdam amounts to at least 6 billion euro or 30% more than the economic importance reported in the Port Monitor.
Volatility in commodity trade

The commodity trading landscape has changed extensively over the past years.

Today an increased number of players, spanning the entire spectrum of commodities with vertical integration.

3 main trends govern the future expectations:

- Increasing competitive pressure
- Capital needs are set to increase substantially
- Banks scale down their own commodity trading activities

Profitability and reliance on assets for selected commodity traders (average 2008-2011)

Source: Meersman, Rechtsteiner and Sharp (2013)

McKinsey commodity price index

Source: McKinsey Global institute
Volatility in commodity trade

The strategic role of traders in cargo routing and port traffic - example for oil products

Source: Meersman, Rechtsteiner and Sharp (2013)
Volatility in seaports
Volatility of maritime indexes
Volatility in Belgian ports
Volatility in Belgian ports

Antwerp throughput

Ghent throughput
Volatility in Belgian ports
Volatility in European ports (1)

- Rotterdam is consistently less volatile than the two other ports.

- Hamburg and Antwerp have both enjoyed periods of stronger growth than Rotterdam, but have also been affected more by the crisis year 2009 than Rotterdam.
Volatility in European ports (2)

Growth and volatility comparison

Growth and volatility comparison for European ports from 10/13 to 12/13.
Volatility in cargo segments

Dry bulk

- **Tonnes**
  - Dry
  - AVG3

- **%**

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Volatility in cargo segments

Liquid bulk

- Tonnes (0-70,000)
- Liquid and AVG3 over years (1980-2012)

Containers

- TEU (0-14,000,000)
- Container and AVG3 over years (1980-2012)

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Volatility in cargo segments

Roro

General cargo

18/12/2013
2. Resilience and flexibility framework
dealing with ‘fuzzy’ and ambiguous concepts
The duality between soft concepts

- Resistive
- Agile
- Specialization
- Lean
- Resilient
- Sustainable
- Redundancy
- Flexibility
The resilient port

The four dimensions of resilience

1. Resistance: Unintended change from growth path
2. Recovery: Speed of recovery from setback in time
3. Renewal: Extent to which previous path is the renewal baseline
4. Adaptation: Learning and change in strategy

The resilient port

- Port resilience
- Port delta
- Other (competing) ports
- Companies within the port
- Port cluster
- Resilience generated by interchangeability within a port set or delta.
- Resilience generated by the aggregate resilience of all port companies.

Companies within the port

Resilience of multiple levels
The agile port

- An agile port, or an agile port company, is an institution which monitors all cargo movements and inventory and sources this in a flexible manner.

- The benefits of an agile system are most prominent in the container industry where agile principles have the highest impact.

- The "Agile Port" concept aims at linking directly through a dedicated rail corridor on-dock rail facilities to a nearby inland rail terminal where containers can be sorted by destination.
The flexible port

- Flexibility helps organisations to deal with the gap between what is known and what should be known.

- A flexible port can be understood as an adaptable port. An organisation and physical assets which can be altered or employed differently and with relative ease so as to be functional and profitable under changing requirements and circumstances.

### Transport Flexibility in seaports: types and definitions

<table>
<thead>
<tr>
<th>Flexibility Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode Flexibility</td>
<td>Ability of a seaport to provide different modes of transport</td>
</tr>
<tr>
<td>Fleet Flexibility</td>
<td>Ability of a seaport to provide different vehicle types to carry different</td>
</tr>
<tr>
<td></td>
<td>goods</td>
</tr>
<tr>
<td>Vehicle Flexibility</td>
<td>Ability of a seaport to configure vehicles to carry products of different</td>
</tr>
<tr>
<td></td>
<td>types/to cater for different loading facilities</td>
</tr>
<tr>
<td>Node Flexibility</td>
<td>Ability to plan, approve and implement/remove nodes (inland terminals,</td>
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<tr>
<td></td>
<td>seaports, etc.) in the network</td>
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<tr>
<td>Link Flexibility</td>
<td>Ability to establish/remove links between nodes</td>
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<tr>
<td>Temporal Flexibility</td>
<td>Ability to sequence infrastructure investment and the degree to which the</td>
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<td></td>
<td>use of such infrastructure requires coordination between users</td>
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<tr>
<td>Horizontal Inter-Organisational Flexibility</td>
<td>The degree to which the use of infrastructure can be coordinated between users</td>
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<tr>
<td>Speed Flexibility</td>
<td>Ability to speed up/slow down transport to meet the customers needs or</td>
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<td></td>
<td>to reduce the capability of the container transport fleet</td>
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<tr>
<td>Service Flexibility</td>
<td>Ability to be able to buffer service levels by building in wider delivery</td>
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<td></td>
<td>windows</td>
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<tr>
<td>Capacity Flexibility</td>
<td>Ability of a seaport and the associated transport system to accommodate</td>
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<td></td>
<td>variations or changes in traffic demand</td>
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<tr>
<td>Routing Flexibility</td>
<td>Ability of a seaport to accommodate different routes</td>
</tr>
<tr>
<td>Communication Flexibility</td>
<td>Ability of a seaport to manage a range of different information types</td>
</tr>
<tr>
<td>Mobility Flexibility</td>
<td>Ability to re-deploy a transport asset</td>
</tr>
<tr>
<td>Ownership Flexibility</td>
<td>Ability to utilise outsourced agents to minimise risk to under-utilisation of asset exposure</td>
</tr>
</tbody>
</table>

Tools and measures for reducing uncertainty

• There are a multitude of possible tools and tricks to reduce risk and uncertainty within any organisation.

• Most of the tools can be put in one of the following categories:
  
  • Modeling tools
    • Sensitivity analysis, life cycle assessment, Monte Carlo analysis,..
  
  • Forecasting tools
    • Adaptive forecasting, near miss analysis,..
  
  • Project management tools
    • Diagramming techniques, swot analysis,..
  
  • Management principles and tools
    • Partner up, Postponement, Customer management, Redundancy inclusion, Update your ERM
3. Application to current issues in ports

Particular difficulties in the port industry and how to deal with them
Flexible port (master) planning

The Adaptive Port Planning (AAP) framework was first created for the airport industry and is being expanded to other sectors. Implementation is a challenge: it requires a change in mentality and approach in the port organisation and all stakeholders closely involved in the planning process.

<table>
<thead>
<tr>
<th>Differences between traditional and adaptive master planning</th>
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<tbody>
<tr>
<td><strong>Traditional approach to Masterplanning</strong></td>
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<tr>
<td>Treatment of the future</td>
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<td>Treatment of uncertainties</td>
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<td>Planning process</td>
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<td>Embedded options</td>
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<td>Focus</td>
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<td>Approach</td>
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<td>Reactivity</td>
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<td>Decision-making</td>
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<tr>
<td>Solution space</td>
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</tbody>
</table>

Source: Based on Taneja (2013)
Towards ‘flexible’ concession agreements: the case of throughput guarantees

• Rigid throughput guarantees work well when the market is witnessing a steady and moderate to high growth. They are not designed to deal with sudden shocks in demand or supply.

• The economic crisis made clear that not only the volume guarantees, but also the penalties associated to these guarantees might be too rigid.

• Three alternative approaches for more ‘flexible’ approaches to terminal throughput guarantees, which can be combined to hybrid approaches.

• All three approaches have their merits and drawbacks.
Towards ‘flexible’ concession agreements: the case of throughput guarantees

• **Option 1. Soft targets + periodic dialogue**

  - Revised based on an evaluation of the current market conditions and strategies;
  - Exchange of ideas on how terminal usage can be further improved;
  - Soft targets as a ‘carrot’ not a ‘stick’ (financial incentives?);
  - Not legally binding (only when the concession fees are affected by reaching the soft targets). So, soft targets only work if both terminal operators and port authorities are committed to reach a better utilization of terminal surface;
  - Port authorities not able to use the volume criterion as part of the decision making process in the terminal awarding process.
Towards ‘flexible’ concession agreements: the case of throughput guarantees

• Option 2. Hard targets on the investment/capacity side
  • Focus on investment guarantees or terminal capacity guarantees
  • Hard targets which can be included in the concession contract
  • Logic behind this approach: TO’s drive for return on investment.
  • Instrumental for avoiding a situation of clear underinvestments during the last years of the concession term.

• Main drawbacks:
  • Discussion moves from the determination of a feasible and fair level of throughput guarantees to a feasible and fair level of investments or terminal capacity.
  • Not foolproof against shocks in demand (cf. economic crisis + risk of overinvestment)
Towards ‘flexible’ concession agreements: the case of throughput guarantees

• **Option 3. A variabilisation of throughput guarantees**
  
  Variable by linking explicitly to changes in endogenous and exogenous factors. For example,:
  
  • A. Changes in the investment levels by the terminal operator (endogenous - combination with option 2)
  • B. Changes in the equipment used (e.g. upgrading) by the terminal operator (endogenous)
  • C. Changes in the demand for cargo handling in a relevant peer group of competing terminals/ports (exogenous)
  • D. A mid-term or multi-annual evaluation of performance and land use in the port and other rival ports (endogenous/exogenous) in view of seeking and updating a fair benchmark for terminal usage.

• Adjusters are put in place to ‘update’ the throughput guarantees to changes in the market environment, technological advances in terminal operations and/or the investment behaviour of the terminal operator.

• Practical issues:
  
  • More difficult as a key awarding criterion in the bidding procedure.
  • Methodological questions. Example alternative C: (1) How to define a relevant range of ports or a relevant peer group of ports?; (2) How to collect the data and to guarantee the reliability of the data gathered?; (3) Should the throughput performance (in terms of growth) of the terminal considered be equal or higher than the average performance in the peer group?

• Adjusted throughput guarantees can either be linked to penalties when the targets have not been reached (‘stick’ approach), but also to bonuses or discounts in case of a performance (far) above target (‘carrot’ approach).
Risk management in port companies

- There is no one-size-fits-all winning strategy for minimizing the risk inherent to the particular trade or activity.

- Modern risk management has evolved tremendously over the past few years. Before the 1970s risk management was limited to taking out insurance.

- Port companies can be classified as non-financial companies. In the non-financial market, risk management is only recently beginning to emerge.
Financial hedging tools

- Hedging tools are one of the most used ways to reduce uncertainty and risk within an organizational financial setting.
- These tools, often provided by banks or comparable financial institutions, offer a multitude of advantages to companies seeking to stabilize their cash flow or reduce investment risks linked to financial markets.
- The application exists for three categories:
  - interest rates,
  - exchange rates
  - commodity prices

Possible hedging choices

- Spot market
  - Do you wish to cover the risk?
  - Decide duration and amount
- Forward Contract/IRS
  - Do you wish to exploit better exchange rates?
- Option contract
  - Are you prepared to pay a premium?
- Zero-cost structure

IRS evolution from 2008-2013

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Hedging commodity price risk

Commodity

Energy

- Brent
- WTI
- ICE Gasoil
- Natural Gas
- Distillates
- Coal

Precious metal

- Gold
- Silver
- Platinum
- Palladium

Base metal

- Aluminium
- Copper
- Nickel
- Tin
- Zinc
- Lead
- Steel

Agricultural Products

- Wheat
- Corn
- Soybean
- Palm
- Coffee
- Cacao
- Sugar

Investors Products

- S&P GS Commdty Index
- Energy Index
- Agriculture Index
...
Black Swans within the port setting

- A black swan is an event or occurrence that deviates beyond what is normally expected of a situation and that would be extremely difficult to predict.

- Examples of historical Black Swans include: the attack on the World Trade Centre, the financial meltdown or even the rise of the internet.

**Black swans within a port setting:**

![Port blockage](image)

![Industrial disasters](image)

![Major disaster](image)
4. Conclusions and recommendations
Conclusions

• Ports are operating in a volatile environment imposed on them by the external environment but also by the actions of market players in the industry.

• A resilient, flexible and adaptive strategy is needed that can adjust to uncertainty and change and which is built into the core foundations of the strategies of port authorities and port-related companies.

• Volatility within the Belgian port system has been fairly constant over the past three decades. Volatility is not necessarily a negative factor.

• Uncertainty faces port authorities with a range of challenges in the context of port planning. Flexible or adaptive port planning is one possible solution.

• Port authorities and terminal operators are challenged to search for more 'flexible' approaches to terminal throughput guarantees: (1) soft targets, (2) investment or capacity guarantees, and (3) a variabilisation of throughput guarantees. It is up to the port authorities and terminal operators to pick the most suitable approach taking into account current practices and traditions in concession policy, and the local culture of decision-making and dialogue.

• Port companies face uncertainty and risks and thus are challenged to develop more resilient, flexible and agile management approaches. Modern risk management has evolved tremendously over the past few years. A cooperation with financial institutions (like banks) is a prime opportunity for these types of companies to change their fundamental attitude towards risk.
Compose yourself the elements for your success in Transport & Logistics
Thank you for your attention!