

COMPARISON OF BUFFER AND CONSIGNMENT STOCK IN THE CZECH REPUBLIC

Petra Vrbová – Václav Cempírek

Abstract

Today's turbulent and highly competitive business environment forces supply chain managers to ensure sufficient inventory level while keeping inventory-related costs as low as possible. Therefore, enormously important aspect of effective inventory management is placing the right amount of safety stock at the right places (for example at a supplier, consignment stock, safety stock) in the supply chain for costs as low as possible. Managing inventory is considered as one of the most challenging tasks facing supply chain managers and specialist due to the fact, that decisions related to inventory locations, level of inventory kept throughout the supply chain have a fundamental impact on the response time, service level, delivery lead-time and the total cost of the supply chain. The concept of Consignment Stock is crucial for helping manage inventories in which the supplier keeps the inventory and maintains a stock of material in the buyer's possession. Nowadays it also becomes an important strategy, which companies adopt in order to face manufacturing and supply chain management challenges. The main objective of this paper is to explain possible reasons of Consignment stock concept preferences in comparison to the Buffer stock concept. The analysis is based on both quantitative and qualitative survey.

Key words: Buffer stock, Consignment stock, Inventory management, Supply chain

JEL Code: E21, E23, R41

Introduction

Managing inventory, especially safety stocks, is one of the most challenging tasks facing supply chain managers. Decisions related to inventory locations and their corresponding levels throughout the supply chain have a fundamental impact on the service level, response time, delivery lead-time and the total cost of the supply chain. These interactions, present at each single link of the chain, render the analysis at the supply chain level much more difficult and complex (Sitompul, 2008). Today's extremely competitive business environment forces companies to manage their inventories as low as possible, get delivered and/or manufactured

with as low costs as possible and still keep their own production running without any significant problem in the whole supply chain. This paper is mainly focused on the Consignment stock and Buffer stock usage, which both is a technique in fact, allow partners, the vendor and the buyer, to reduce management costs and increase their flexibility. In a traditional supply chain where products are sold under wholesale, an upstream entity (supplier) sells a product to a downstream party (retailer) who in turn serves market demand. The retailer owns and controls the inventory and thus incurs the cost of stocking excess inventory to meet demand that exceeds expected demand and/or incurs stock-out costs when demand exceeds supply (De Matta, 2014). Alternatively, under a Buffer stock or Consignment stock MIN and MAX concept, the supplier keeps a particular amount of safety stock and control of inventory at buyer`s stock, determining the stocking level (MIN and MAX level) and product pricing.

Decisions related to inventory locations and their corresponding levels throughout the supply chain have a fundamental impact on the service level, response time, delivery lead-time and the total cost of the supply chain. These interactions, present at each single link of the chain, render the analysis at the supply chain level much more difficult and complex (Sitompul, 2008). The stocks cannot be called safety stock. Two things work in our favour here: the Law of Big Numbers, because it is dealing with items that are standard subassemblies and is consequently used across a range of end-products. And the fact that with such items, to some extent at least, it will be buffered against fluctuations in end-product demand by swings and roundabouts. An increase in demand for one end-product may well be balanced by a decrease in demand for another. Real demand can be surprisingly stable at this level (Graham, 2015).

1 Literature review

1.1 Buffer stock MIN MAX concept

The major idea of the Buffer stock is its placement at a particular critical stage of supply chain. Therefore, it might consist of materials in a different step or phase of its production. It means that it might comprise of raw materials, finished and semi-finished goods. Raw materials are very useful for buyers to be kept in Buffer stock due to the fact, the delivery time might be up to 6 months. As Sitompul (2008) explains, very efficient way to tackle the effect of demand variability in a supply chain composed of locating safety stock at a number of upstream stages. The problem then is to determine the right location (i.e. the right stage) and the right amount of stock that must be kept to ensure the required overall service level at the lowest cost.

A buffer stock model or a scheme works as an attempt to use commodity storage for the purposes of stabilising prices in an entire economy or, more commonly, an individual (commodity) market (Morrow, 1980). The Buffer stock scheme works in two examples. The first is when there are two prices (minimum and maximum). When price reaches the minimum point (because of higher yields or because there is a new way how to get some resources, oil for example), mostly the government buys the stock, it does not fall anymore. And when the price starts to grow again the owner puts some of the stock on the market so price does not get too high. But in the time before that stocks must be stored or stay away from the market for example by their destruction. If a basket of commodities is stored, their price stabilization can in turn stabilize the overall price level, preventing inflation. This helps to lower fluctuation and improve stability of the market. The second one is when there is only one price (minimum and maximum are equal). The scheme is used to ensure the right (fixed) price. There are some differences between supply and demand of stocks as the time goes. But the government buys more stock when there are high yields and during the years where there is on enough supplies sells them so the price is regulated. Furthermore, there must be changes in the amount of supplies during the time as the new trends flows. Therefore, the interventions sustain effective. The main advantages of buffer stock scheme are stable prices and supplies. There may also be other effects of this activity as rise of domestic industry thanks to taxes interventions or higher value of home currency. The upsides are costs of supplies and their amount. There must be enough capacity for storage and there can be cases where the stocks are destroyed which does not help to the price of commodities. Kanet (2010) says that by their analysis the improvement in inventory of buffer stocks should be more conservative since nowadays there are implemented by firms at the stock keeping unit level, which is far removed from the aggregated (less variable) industry demand.

1.2 Consignment stock MIN a MAX concept

CS is a logistic technique in which the vendor, instead of the buyer, is in charge of managing the buyer's inventory and triggering replenishment orders. This makes possible a partial suppression of the vendor's warehouse, which can be replaced by that of the buyer (Braglia, 2013). In particular, the buyer virtually removes the procurement lead time, since the responsibility of the replenishment lies completely with the vendor, who keeps a stock of its property at buyer's plant: the buyer uses the stock materials according to his daily production requirements (Abdel-Malek, Kullpattaranirun, Nathavanij, 2005). Consequently, it is possible to minimize both the ordering and the stock holding costs of the buyer, because materials

formally owned by the vendor can be collected (that is, purchased) by the buyer only upon demand. On the other hand, the vendor gets visibility regarding the customer's demand and can use this precious information to schedule production and replenishment orders in an optimal way. As a counterpart, in doing so he is responsible for keeping the buyer's inventory between a maximum (S) and a minimum level (s) and he also supports any additional cost due to stock-outs if his stock management strategy is not suitable to assure the required service level (Braglia, 2013).

The CS policy is already widespread in a number of industrial realities and it is obtaining raised consensus in both small and large contexts, since it offers a partial solution to the 'cycle time reduction' problem and avoids any shortage of materials through enhanced communication between suppliers and buyers. The technique in fact allows partners, the vendor and the buyer, to reduce management costs and increase their flexibility. In particular, the buyer virtually removes the procurement lead time, since the responsibility of the replenishment lies completely with the vendor, who keeps a stock of its property at the buyer's plant: the buyer uses the stock of materials according to his daily production requirements. Outsourcing of materials can easily incorporate the CS policy to enhance supply chain operations (Battini, 2010). Consignment Stock (CS) is an innovative approach to supply and stock management, based on a strong and continuous collaboration between vendor and buyer to create a "win-win" situation, where both partners have equal gains (Battini, 2010). There is an obvious advantage for buyers. They have available stock and they can pay later for that. For sellers there is a very high certainty of supply and demand turnover when the stocks are with customers and the sale is almost guaranteed. In addition, they save space in their own warehouses. Furthermore, it saves time to every part of the deal due to the fact, that the material is being ordered by system which is based on MIN and MAX concept. Trust and sufficient communication between both – vendor and buyer - has a crucial role here. Both parties should negotiate exact terms which they can fulfil. Additionally, both parties should agree in which conditions the seller may have access to the warehouse.

2 Problem statement and research objective

Inventory management has a significant role in this turbulent and extremely high competitive time and/or environment. Costs cutting and additional costs avoiding measures reducing capital in inventory forces Inventory managers to implement various arrangements in order to avoid high value and amount of stock but with the highest priority in availability of material for the

production etc. Our main intention was to observe the share of particular logistics models' adoption. After finding these results out, it is possible to analyse, why there are particular models more preferred than the others. For purpose of this paper, there are Consignment stock (MIN MAX model), Buffer stock (MIN MAX), Safety stock and Others (group of miscellaneous types as for example Kanban, Smartbin, JIT deliveries, shared stock with multiple suppliers) considered as logistic models.

There were many papers, studies, analyses, formulas etc. dealing with logistic models themselves. The problem is that there is a little known about usage of logistic models in terms of a practical adoption, utility according to size of companies, locations and industries. Therefore, the main objective of this paper is to analyse and/or find out which logistic models are used in the Czech Republic, comparing their usage and adoption according to size of companies focusing on explanation of possible reasons of particular preferences of some logistic model to another one. The analysis is based on both quantitative and qualitative survey.

3 Basic features of the sample

The research was divided into two phases – the first one was held between September to November 2015 as a quantitative research. The second one was held in the period between December 2015 – February 2016 as a qualitative research. For the purpose of this paper both quantitative and qualitative survey obtained in the Czech Republic. A field of survey was used to investigate the research questions. A structured questionnaire was utilized as the main data collection in the first part of our survey. Respondents/companies were sampled from various industries, sizes and annual sales, randomly selected and contacted in order to filling our questionnaire.

Tab. 1: Industry distribution

Name of Industry	Number of firms	Percentage
Auto/ Auto parts industry	10	6%
Building industry	12	7%
Ceramic industry	7	4%
Chemical product manufacturing	9	5%
Drug manufacturing	7	4%

Electronics industry	11	6%
Food manufacturing	17	10%
Paper industry	9	5%
Plastics industry	15	8%
Retail industry	17	10%
Service industry	8	5%
Steel/metal manufacturing	33	19%
Textile manufacturing	9	5%
Transportation industry	6	3%
Wood industry	7	4%
Total	177	100%

Source: Authors

There were in total 231 companies addressed in various areas of the Czech Republic. 54 companies didn't give us any feedback or refused to participate, thereby we compiled 177 replies. The response rate was 77%. Table 2 demonstrates the industry distribution of the sample. Table 3 summarizes the basic features of sample concerning company size.

Tab. 2: Companies' distribution

Size of company	Number of firms	Percentage
Small	68	38%
Medium	51	29%
Large	58	33%
Total	177	100%

Source: Authors

4 Key results

4.1 Advantages and disadvantages of BS and CS concept from the suppliers` and customers` perspective

First we identified share of particular logistic concepts in the Czech republic. According to the results, there was the second part of our survey used a quantitative research – structured

telephone interviews were the main method of data collection. Our research was investigated with just those respondents using and/or providing the Buffer stock, Safety stock and Consignment stock MIN and MAX concept. Structured phone interviews were utilized as the main collection method. Phone interviews conducted with the persons in charge of the responsibility about Buffer stock and Consignment stock concept adoption. This concept was conceived mainly on the results of survey investigated in the Czech Republic. For the purpose of this research, we questioned again 23 respondents regarding the Buffer stock asked all and Consignment stock plus Safety stock together 107, but we have randomly contacted 60 companies – in total 83 were contacted again. However, we have got 18 replies from the Buffer stock adopted companies and 36 replies from other companies adopting CS concept and Safety stock concept. In total 29 companies refused to participate again.

For both, Consignment stock and Buffer stock MIN and MAX concept, there are several common features such as a contract requirement, setting up MIN and MAX borders, electronic platform for data exchange usage, frame purchase order preferred etc. Additionally, for better understanding, advantages, disadvantages and differences between these two concepts, there are specified the major factors both in the Table 3 and Table 4.

Tab. 3: Advantages of CS and BS concept adoption from both supplier and customer perspective

Advantages			
Consignment stock concept		Buffer stock concept	
Suppliers` perspective	Buyers` perspective	Suppliers` perspective	Buyers` perspective
	Payment for the material consumed only at the moment of its consumption	Payment after each delivery (not considering individual payment conditions)	
	Inventory ownership until consumption		Inventory ownership partially distributed between supplier and buyer * in each separated stock financially covered by the owner of the warehouse

* Production planning on supplier`s responsibility			
	Continuity of the production process ensured		Continuity of the production process ensured
	Reduction of the business capital cost		Reduction of the business capital cost

Source: Authors

From the buyers' point of view, both concepts find an advantage for buyers in the production planning as it is on the suppliers' responsibility, continuity of the production process is ensured and reduction of costs of business capital. From the suppliers' point of view, our respondents find advantages in a major responsibility for the whole process of production planning, deliveries etc. on one hand. On the other hand, there are several advantages that might be significant for the suppliers, buyers in terms of logistic concepts' adoption. Despite the fact that while the consignment stock implementation, foreign suppliers need to be registered for the tax purposes in the country of the buyer. A crucial disadvantages of BS concept might be the obligatory to keep particular amount in stock on his/her side and another stock in buyer's stock, increase of frequency of deliveries and tighter spread of MIN and MAX borders.

Tab. 4: Disadvantages of CS and BS concept adoption from both supplier and customer perspective

Disadvantages			
Consignment stock concept		Buffer stock concept	
Suppliers` perspective	Buyers` perspective	Suppliers` perspective	Buyers` perspective
Tax registration of foreign suppliers needed			
Regular payment of used pieces only			
		Need to keep a stock in suppliers` warehouse	
		MIN and MAX border might be set lower than with the CS concept	
*Full responsibility for deliveries,		**partial responsibility for deliveries,	**partial responsibility for

production planning on supplier's side		production planning on supplier's side	deliveries, production planning on supplier's side
	Problems with claims		
		Increase frequency of deliveries	

Source: Authors

* considered by respondents as an advantage on one hand as well as disadvantage on the other hand

** considered by respondents as a disadvantage just in case of inconveniences connected to the process of adoption, getting used to the new way of deliveries and orders on both sides – supplier and buyer

Conclusions

Our survey paid attention to results of preferences of CS and BS concept – comparing advantages and disadvantages from the suppliers` and buyers` point of view.

There was a deeper explanation of how different conditions of CS or Buffer stock concept adoption influence their utilization in reality according to found out pieces of information based on interviews with particular respondents of a research above mentioned. Additionally, we were able to distinguish the major advantages and disadvantages from both a supplier and a customer point of view due to the phone interviews as the second step of our survey. Future work might be focused on specification of which industry or business area implement which logistic model and also which size of company adopt which logistic model and/or an analytical and numerical model comparing vendors' costs (set-up costs, holding costs, obsolesce costs and stock-out).

References

- Abdel-Malek, & L., Kullpattaranirun, T., & Nathavanij, S. (2005). A framework for comparing outsourcing strategies in multi-layered supply chains. *International of Production Economics*, 97 (3), 318-328.
- Battini, D. (2010). Consignment stock inventory model in an integrated supply chain. *International Journal of Production Research*. 48(2): 477-500, DOI: 10.1080/00207540903174981. ISSN 00207543.

- Battini, D. (2010). Consignment stock inventory policy: methodological framework and model. *International Journal of Production Research*. 48(7): 2055-2079. DOI: 10.1080/00207540802570669. ISSN 00207543.
- Braglia, M. (2013). Consignment stock theory with a fixed batch manufacturing process. *International Journal of Production Research*. 51(8): 2377-2398. doi: 10.1080/00207543.2012.740577. ISSN 00207543.
- De Matta, R. E. (2014). Consignment or wholesale: Retailer and supplier preferences and incentives for compromise. *Omega*, 49: 93-106. DOI: 10.1016/j.omega.2014.05.011. ISSN 03050483.
- Graham, S. (2015). Effective and efficient use of safety or buffer stock. *Operations Management (1755-1501)*. 38(5), 27-31. ISSN 17551501.
- Kanet, J. J. (2010). Dynamic planned safety stocks in supply networks. *International Journal Of Production Research*, 48(22), 6859-6880. Retrieved March 6, from <http://doi.org/10.1080/00207540903341887>.
- Morrow, D. T. (1980). The economics of the international stockholding of wheat (1st ed.). Washington, D.C.: *International Food Policy Research Institute*.
- Sitompul, C. (2008). Safety stock placement problem in capacitated supply chains. *International Journal of Production Research*. 46(17): 4709-4727. doi: 10.1080/00207540701278406. ISSN 00207543.
- Sitompul, C., & Aghezzaf, E., & Dullaert, W., & Van Landeghem, H. (2008). Safety stock placement problem in capacitated supply chains. *International Journal of Production Research*. 46(17): 4709-4727. DOI: 10.1080/00207540701278406. ISSN 00207543.

Contact

Faculty of Economy and Administration
University of Pardubice
Studentská 95, 532 10, Pardubice 2
pe.vrbova@gmail.com

Václav Cempírek
University of Logistics o.p.s.
Palackého 1381/25, 750 02 Přerov I-Město
vaclav.cempirek@vslg.cz