
FINANCIAL RISK MANAGEMENT IN GLOBAL LOGISTICS

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***Abstract:** The paper presents and analyzes changes in global trade, global logistics markets and financial instruments used to value and hedge services in global logistics markets. The logistics industry is an interesting example on how physical markets have followed the state of financial and information markets in such a way as to support globalization and outsourcing. It is also one of the necessary elements of infrastructure that supports the expansion of international trade. The integration of financial and physical markets is a main force for the emergence of global logistics. The growing need of insurance in a changing volatile business environment resulted in the expansion of financial instruments. Risk management products based on derivatives, such as futures, forwards, options and swaps can provide the backbone for risk management in logistics. Derivatives are an important financial instruments because they allow risks to be separated and controlled. Logistics has followed the trend similar to all other commodity markets, from purely physical contracting, to full derivatives markets for valuation, sourcing and hedging.*

***Keywords:** globalization, physical and financial markets, financial risk, derivatives.*

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1. INTRODUCTION

The evolution of logistics markets, and their integration with physical and information markets, resulted from the process of globalization and expansion of international trade. The network effects of globalization, unbundling and re-bundling encompassed by the new logistics are staggering. The supply chains have become long and complex global networks within which a multitude of actors are highly interconnected through goods/services, information, and financial flows.

The economic history of globalization shows how specialization and trade stimulate economic growth and why integration of financial and physical markets is necessary to mediate value-added networks.

The new global business environment created by globalization creates new challenges and risks for every participant in international trade and global logistics. These new risks and above all financial risks are the subject of this paper. The appearance and use of new financial instruments (financial derivatives) on financial markets provide the opportunity to companies to manage and hedge these types of risks.

2. GLOBALIZATION, WORLD TRADE AND GLOBAL LOGISTICS

The last decades have seen vast changes in the functioning of the world economy, dubbed as globalization. According to the World Bank, globalization refers to the growing interdependence of countries resulting from the increasing integration of trade, finance, people, and ideas in one global marketplace. International trade and cross-border investment flows are the main elements of this integration. Globalization started after World War II but has accelerated considerably since the mid-1980s. It was driven by two main factors. One involves technological advances that have lowered the costs of transportation, communication, and computation so that it is often economically feasible for a firm to locate different phases of production in different countries. The other important factor refers to the liberalization of trade and capital markets [13].

Empirical evidence suggests that globalization has significantly boosted economic growth in East Asian economies such as Hong Kong (China), the Republic of Korea, and Singapore. But not all developing countries are equally engaged in globalization or in a position to benefit from it. The

most developing countries have been rather slow to integrate with the world economy [12]. Moreover, for countries that are actively engaged in globalization, the benefits come with new risks and challenges. The globalization's costs and benefits for different groups of countries and the world economy is one of the most challenging topics in development debates.

The volume of world trade increased twenty-seven fold from \$296 billion in 1950 to \$8 trillion in 2005 [14]. In recent years world trade has declined in volume and was down in 2012 and is expected to remain sluggish through 2013. This is a result of the struggling economies of Europe and crises of Eurozone. As a result, world trade growth fell to 2.0 per cent in 2012 — down from 5.2 per cent in 2011 — and is expected to climb only slightly in 2013, to around 3.3 per cent [15].

Logistics become one of the key factors in the global interdependence that determines profitability and uncertainty for management, Figure 1.

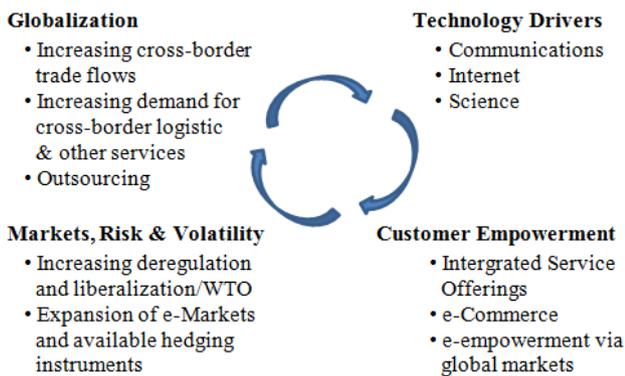


Figure 1. Key factors of interdependent mega trends [8, p.6]

In international trade, containership cargo traffic is estimated at 10.5 trillion revenue tonne-kilometres (RTKs) in 2011, while world air cargo traffic is 202 billion (RTKs). The largest containership markets mirror the largest air cargo markets. In 2011, Europe–Asia was the largest containership market, with 2.8 trillion (RTKs), followed by Asia–North America with 1.9 trillion RTKs and Europe–North America with 0.3 trillion RTKs [3].

Until the global economic recession of 2009, the containership industry had grown steadily every year since its inception. Between 1980 and 2011, containership tonnage averaged 8.9% growth per year.

Expansion of physical capabilities in international logistics began in the 1990s and has continued with increases in capacity in nearly every established port and air hub. This increase in physical capabilities was accompanied by increased sophistication and intermediation activities of

brokers and forwarders, followed by the development of financial overlays and trading instruments for air cargo and shipping capacity. In the last decades, globalization and the associated unbundling of value chains have been the most influential in the growth of logistics[8].

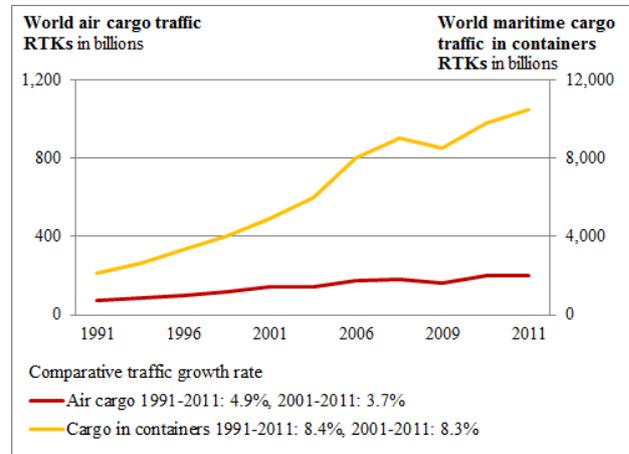


Figure 2. World containership traffic growth and air cargo growth [3, p.8]

A number of different organizations and economics transactions are involved in the basic structure of international logistics operations as shown in Figure 3. Some of these are public (e.g. terminal and port facilities) and some are private. Tremendous growth of global trade gave rise to increasingly liquid markets for buying and selling services. These markets used to be contract markets for physical capacity. But, during the last decade the financial instruments took on a very important role in international air cargo and maritime operations with the main goal of facilitating price discovery and risk management.

In international logistic market sellers of logistics services compete to supply buyers of such services. Buyers can reserve capacity through forward contracting or through various types of options obtained from the seller. Sellers compete for the buyer's business in the forward and contract market. In the short term market (the spot market), competitive spot market price is determined. In the contract market, larger buyers and sellers often have long-term relationships because they need to satisfy credit requirements, insurance and other criteria. But, even in that case, buyers still use spot markets as a second source of supply for some of their logistics services and as a means of evaluating prices in contract purchases.

In so complex environment it is of great importance to have market-traded instruments that provide transparent and objective information on availability of various logistics services as well as their prices.

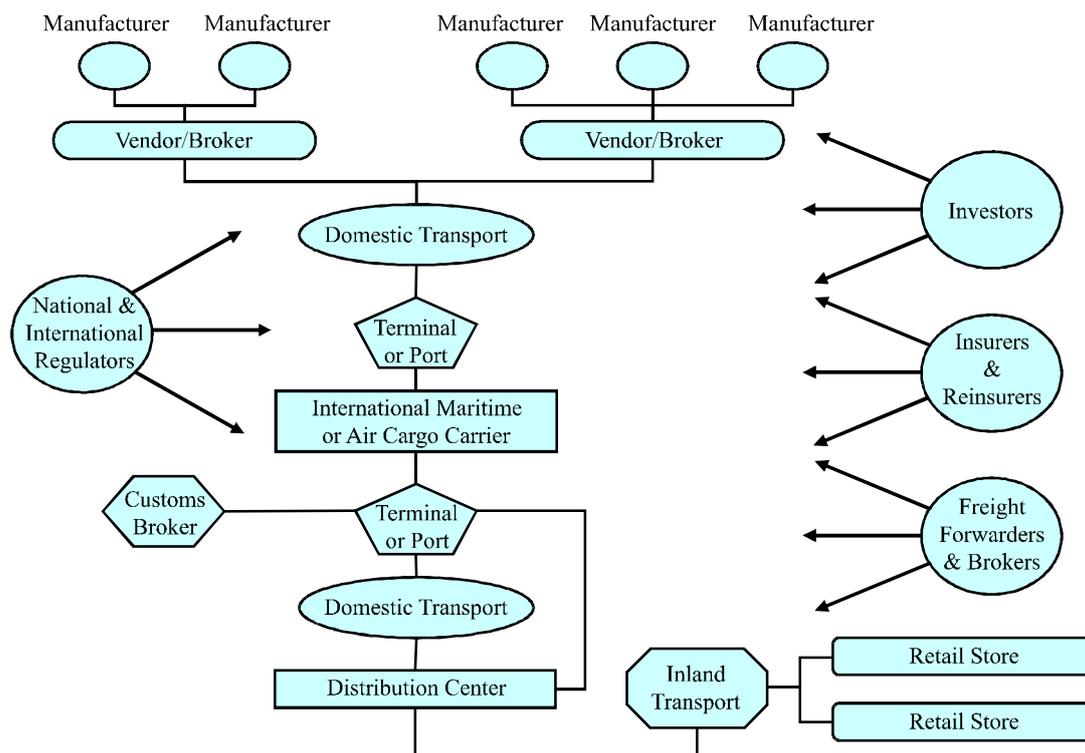


Figure 3. Actors in Global Supply Chains [8, p. 11]

3. FINANCIAL RISK MANAGEMENT IN SHIPPING

We intuitively associate risk with a probability of an undesired outcome. In economics, risk refers to situations in which we can list all possible outcomes and we know the likelihood that each outcome occurs [10]. In finance, risk is a possibility that the actual outcome is likely to deviate from the expected value. Risk is equated with uncertainty in payoffs, which will be referred to as profit variability risk. Risk then implies the existence of some random variable whose standard deviation or variance can be used as a measure of risk.

Operational risks are risks that resulted from operations, i.e. from activities and resources. Any potential source that generates a negative impact on the flow of information, goods, and cash in our operations is an operational risk. The inclusion of cash implies that financial and operational risks are not mutually exclusive [9].

Fundamentally, the value of a company depends on the expected net cash flows from its operations. Therefore, any factor that may have a negative impact on the expected net cash flows is identified as a risk. Harrington and Niehaus classify business risks in three categories: price risk, credit risk and pure risk [5].

Price risk refers to uncertainty over the magnitude of cash flows, due to possible changes in

output and input prices. A vast literature deals with risks of shipping companies, i.e. freight-rate risk. This risk refers to the variability in the earnings of a shipping company due to changes in freight rates. Volatility in freight markets has a direct impact on the profitability of the company.

Volatility on the costs side is also a factor affecting the profitability of shipping companies. Perhaps the most important cost components for a shipping company is the cost of fuel oil, called bunkers, used by the vessel in performing a voyage. Bunker costs, on average, account for more than 50 per cent of the total voyage costs [1].

Interest-rate risk arises from exposure to changes in interest rates. The capital-intensive nature of air and shipping companies implies that most vessel acquisitions are financed through term loans priced on a floating rate basis. Unanticipated changes in interest rates may create cash flow and liquidity problems for companies which may no longer be able to service their debt obligations.

Credit risk, also known as “counter-party risk”, is the uncertainty surrounding whether a counter-party to a transaction will perform its financial obligations in full and on time.

Pure risk is defined as the risk of reduction in the value of business assets due to physical damage, accidents and losses.

The risk-management process includes: (i) risk identification; (ii) risk evaluation; (iii) risk management; and (iv) risk monitoring.

The first step in the risk-management process is risk identification (identification of loss exposures). Risk identification requires an overall understanding of the business and the specific economic, legal and regulatory factors which affect the business.

Risk evaluation involves managers quantifying the exposure of the company to each risk factor, and usually involves measuring the expected losses and the standard deviation of losses over a period of time. This step generates the right incentive for a company to hedge. Another important parameter here is the sensitivity of each company to the different risk factors. For instance, an increase in bunker prices will, in general, have a negative impact on the cash flow positions of shipping companies. However, this impact will be less for a company that has chartered out her fleet on a long term basis, compared to a company that operates in the spot market and will therefore need to increase freight rates in order to maintain its profit [10].

The next step is the selection of the instruments which are best suited to the management of those risks. This depends on the type of risk that is to be hedged. Price risks are managed using derivative contracts such as futures, options and swaps.

The last step in the risk-management process is monitoring the performance and suitability of the risk-management methods and strategies on an ongoing basis.

One of the most important steps in any risk-management process is risk measurement and quantification. In shipping, fluctuations of freight rates, bunker prices, ship prices, and even interest rates and exchange rates can have a severe impact on the operating profitability and business viability of the agents involved [4].

During the last decade, the growth of financial instruments has been driven by underlying demand for risk management products.

4. FINANCIAL DERIVATIVES AND THEIR USE IN SHIPPING

Financial derivatives are financial instruments that are linked to a specific financial instrument or indicator or commodity, and through which specific financial risks (such as interest rate risk, foreign exchange risk, equity and commodity price risks, credit risk etc.) can, in their own right, be traded in financial markets [6].

Financial derivatives are used for a number of purposes including risk management, hedging,

arbitrage between markets, and speculation. Before derivatives products were originally designed to meet the needs of hedgers. Organised trading in commodity futures markets dates back to the mid-1860s with the opening of the Chicago Board of Trade. The market at the time was designed to assist farmers who wanted to lock in advance a fixed price for their harvest.

If we take value of underlying entities such as an asset, index or interest rate, we can derive the value of financial instruments called derivatives. It has no value in itself. Derivative contracts could be based on structured debt obligations and deposits, swaps, options, futures, forwards and some other variety of financial contracts. Derivatives can be traded in OTC (over-the-counter or off-exchange trading) and on organized markets. For shipping charterers the most important derivatives are: forward, futures and swap. Each of these types of contracts bind the parties to exchange money or goods according to a predetermined schedule in the future. Swap contracts are more complex, but can be easily decomposed to the portfolios of forward contracts.

Financial transactions commonly take place on the spot market. This implies that delivery of goods or securities must take place as soon as possible. In contrast to these spot contracts are term contracts. The first form of term contract was a forward contract or simply forward. That is a non-standardized agreement between two parties, about exchange of a certain asset for cash, at a specified future time at a price agreed upon today. One party is buying the underlying asset in the future and takes the so called, long position, while the other party is agrees to sell that asset and assumes a short position.

Delivery price is the price both sides agreed upon, and actually that is the price of the forward contract at the time of the agreement. All exchanges are made solely on the due date, that is a forward contract has no cost. However, at maturity one party will be at a loss compared to the other [11]. Obviously, the profit of the long position is the same as the loss of the short position, which means that the contract is a zero-sum game.

Understanding the basis is fundamental to using futures for hedging. The basis in a hedging situation is defined as: spot price of the asset to be hedged, S_t , minus the price of forward contract used for hedging, $F(t, T)$:

$$\text{Basis} = S_t - F(t, T) \quad (1)$$

Depending on the sign of the basis, the market is also characterised as being in 'backwardation' or 'contango'. For instance, if the basis is positive (that is, the spot is higher than the forward) we say that

this contract is backwarddated. On the other hand, if the basis is negative then the market is in contango.

The terms backwardation and contango are also used to describe the entire shape of the forward curve as well. For instance a rising forward curve, where forward prices increase as time to maturity increases, is said to be in contango; and a falling forward curve is said to be in backwardation, as shown in Figure 4. [1].

Since forward contracts are just agreements on the exchange in the future, they certainly carry credit risk. Futures contracts are precisely specified to be a way to reduce this credit risk to a minimum. In its essence futures contracts do not differ too much from the forward contracts. Both contracts represent the two parties' agreement on the exchange of two assets in the future at a predetermined price.

Again parties taking two different positions; the buyer (the party agreeing to buy the underlying asset) assumes a long position because of expectations that the asset price is going to increase. On the other hand, the party agreeing to sell the asset in the future, expects that the asset price will decrease in the near future, is said to be "short".

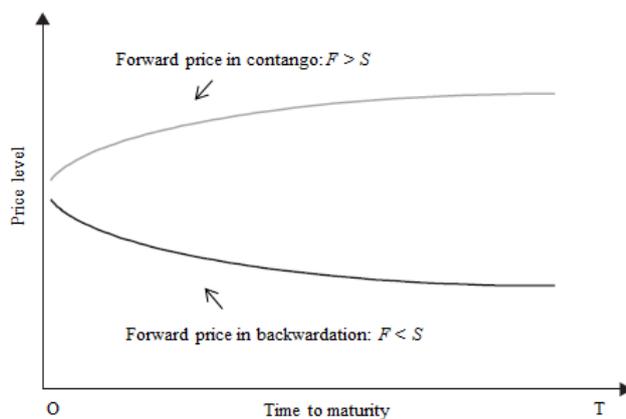


Figure 4. Backwardation and contango forward curves

Swaps are derivatives which were first used in 1981 when IBM and the World Bank entered into this type of agreement. With a swap the two sides are agreeing upon the exchange of cash flows. This includes counterparties financial instruments so the cash flows of one party could be exchanged for those of the other party. Therefore, swap contracts are OTC agreements on the exchange of cash flows. Cash flows to be exchanged can be determined by interest rates, currency exchange rates, stock prices or raw materials prices, as well as stock market indexes. Further conditions and treatments depend on the type of financial instruments involved. How much swaps are significant derivatives is shown by the fact that the total amount of interest rates and

currency swaps outstanding is about \$402 trillion in December 2011, according to the Bank for International Settlements (BIS)[2].

An option is a financial instrument which gives its owner the right to buy (in case of Call option) or sell (in case of Put option) an underlying asset at fixed price called an Exercise or Strike price and in some future moment called Exercise time. It gives the right, but does not imply an obligation. Exercise means the exploitation of owner's right given by an option. This Exercise time is limited by time to maturity. After the expiry of maturity, an option ceases to be valid.

There are two types of options according to method of exercise: American and European options. While an European option may be exercised only at the expiration date of the option, an American option can be exercised at any time before the expiration date.

Shipping represents the major mode of transportation of international trade as well as the focal point for value-added logistics services in the world economy. Shipping markets are characterized as capital intensive, cyclical, volatile, seasonal and exposed to the international business environment. That's why the introduction of proper risk management strategies in an industry which is characterized with cycles and high volatility in its prices is important. The existence of derivative products in shipping has made risk management cheaper, more flexible and available to parties exposed to adverse movements in freight rates, bunker (fuel oil) prices, vessel prices, exchange rates, interest rates and other variables affecting the cash-flow position of the shipping company and its customers [7]. Similar trends are emerging for air cargo logistics which are still less developed in the use of these financial derivatives.

5. CONCLUSION

The latest experiences on the global logistics services market show that for now and above all, shipping companies have begun to use various financial instruments in order to upgrade and more successfully manage financial risks. Certainly this new area of risk management requires new knowledge and competencies.

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