Essays on the US Public Equity and High Yield Bond Markets as a Source of Finance for Shipping Companies

by

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In Memory of my Grandfathers,
Ioannis Vitas and Nikolaos Papapostolou

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Declaration

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Abstract

This thesis attempts to identify important factors that may affect the pricing and the probability of default of high yield bonds offered by shipping companies; and factors that may influence the pricing and the probability of underpricing of shipping US initial public offerings (IPOs). The analysis is carried out through five chapters and each chapter covers a topic on its own so that it can be read independently of previous and subsequent chapters.

Chapter 1 provides an overview of the shipping US public equity market for the period 1987-2010. It also considers the reasons for a shipping company to go public; the advantages and disadvantages of such a decision; and the role of underwriters in the IPO process. Finally, it provides a literature review on shipping equity capital markets.

Chapter 2 presents an overview of the shipping US high yield bond market for the period 1992-2010; it discusses the seniority of shipping high yield bonds, and, the advantages and disadvantages for shipping companies that decide to issue high yield bonds. Next, the credit ratings, the yield premia and the probability of default for shipping high yield bonds are examined. Finally, it provides a synopsis of the restructuring options that shipping companies have in case of default.

Chapter 3 investigates the factors that may explain the dynamics of yield premia on seasoned shipping high yield bonds. The analysis utilises 40 seasoned high yield bonds offered by 32 shipping companies for the period April 1998 - December 2002; and it employs a set of microeconomic, macroeconomic and, industry related factors. The methodology used is the fixed effects panel data regression model and the results of the study suggest that the dynamics of yield premia of seasoned shipping high yield bonds can be explained by: the credit rating; the term-to-maturity; the changes in earnings in the shipping market, as well as the changes in the yields on the 10-year US Treasury bonds and the Merrill Lynch single-B index. This chapter contributes to the existing ship finance literature in the following ways: first, it attempts to model the changes of yield premia on shipping high yield bonds in the secondary market, which is of interest to investors and traders since information on changes in yield premia can be used for investment and asset allocation purposes. Second, it

distinguishes between high yield bond issues offered by listed and unlisted companies, as well as, defaulted and non-defaulted bond issues in order to examine whether there is any difference in the impact of the explanatory variables on the determination of yield premia. Third, the analysis employs a set of macroeconomic and industry related factors that have not been previously used in the ship finance literature. Finally, the results may have implications for shipping companies in the following ways: yield premia are indications of the possible cost level in order to enter the shipping high yield bond market and may affect the company's image; hence, shipping companies may be interested in the yield premia as they can affect their financing decision for future/further issuance of high yield bonds or their possible stepping to the equity capital market.

Chapter 4 uses a binary logit model to predict the probability of default for high yield bonds issued by shipping companies for the period 1992-2004. The results suggest that two liquidity ratios, the gearing ratio, the amount raised over total assets ratio, and an industry specific variable are the best estimates for predicting default at the time of issuance. In - and out - of sample bootstrap tests further indicate the predictive ability and robustness of the model. This chapter contributes to the existing ship finance literature as for the first time the probability of default of shipping high yield bonds is predicted by employing a binary logit model. Investors may benefit from this research since, by employing easily accessible and quantifiable factors they can identify at the time of issuance a) which factors to look at when making investment decisions; b) issues that may have a high likelihood to default. At the same time, shipowners who offer high yield bonds can also identify and focus on the factors that are important in predicting the probability of default for their bond issues.

Chapter 5 examines the extent that public information, available prior to the US initial public offering of shipping companies, is only partially incorporated in the final offer price set by the underwriters. The sample includes 51 shipping US initial public offerings for the period 1987-2008, and a set of prospecti and market specific characteristics is employed. The Ordinary-Least-Squared Regression results show that 20-53 percent of the variation in first day returns is explained by employing public available information known prior to the offer

date; therefore, it can be argued that final offer prices of shipping US IPOs are only partially adjusted to broadly accessible information. Additionally, the probability of underpricing is examined and the logit model correctly predicts 90 percent of the entire sample, with in and out-of-sample bootstrap tests further supporting the robustness of the model. This chapter contributes to the existing ship finance literature by testing the hypotheses of partial adjustment (Benveniste and Spindt, 1989) and winner's curse (Rock, 1986) theories as an explanation for shipping US IPOs' initial day returns. Moreover, it uses variables that have not been previously employed in shipping IPOs studies and the probability of underpricing a shipping IPO is examined for the first time. Finally, the results of the study show that by employing readily available information known prior to the shipping IPO date, investors can identify the factors that affect the initial day returns and also predict the probability of underpricing a shipping IPO.

Chapters 1 and 2 are parts of chapters 20 and 21 in the book "The Blackwell Companion to Maritime Economics" (Grammenos and Papapostolou, forthcoming (a), forthcoming (b)). Chapter 3 has been published in Transportation Research Part E: Logistics and Transportation Review (Grammenos, Alizadeh, and Papapostolou, 2007) and an earlier version was presented at the International Association of Maritime Economists (IAME) conference in Izmir, Turkey in 2004. Chapter 4 has been published in Transportation Research Part E: Logistics and Transportation Review (Grammenos, Nomikos, and Papapostolou, 2008) and an earlier version was presented at the International Association of Maritime Economists (IAME) conference in Limassol, Cyprus in 2005. Finally, chapter 5 has been submitted to Transportation Research Part E: Logistics and Transportation Review and it is under review.

Contribution of Thesis

This thesis investigates different issues regarding the US capital markets, public equity and high yield bonds, as a source of finance for shipping companies. Given the number of defaults on shipping high yield bonds that occurred in 1998-1999; the renewed interest of shipping companies in issuing high yield bonds after 2002; and finally, the fact that only one research paper has been written on shipping high yield bonds prior to this thesis, makes the thesis' contribution to the ship finance literature to stand out. At the same time, the increased interest of shipping companies to enter the US public equity market after 2003 led to the production of a research paper with a different research angle than previously in the ship finance literature.

To start with, this is the first piece of research giving an overview of the shipping US high yield bond market since its commencement. The dynamics of yield premia on shipping high yield bonds, which are of interest to investors and shipping companies alike, are studied for the first time; while, light is shed on the probability of default of shipping high yield bonds and the characteristics of shipping companies that defaulted on their bond issues. All are topics that have never been investigated since the inception of the US shipping high yield bond market and the first issue by Sea Containers Ltd. in 1992.

Additionally, an overview of the shipping US public equity market is given; something that has never been conducted in the past. Then, the widely known phenomenon of underpricing is investigated, and although papers on the subject already exist in the ship finance literature, this thesis looks at underpricing from a different perspective. For the first time in the ship finance literature, financial ratios, offering characteristics and market conditions are all married in order to test whether there is asymmetry of information between the participants in a shipping initial public offering. Having established that there is no asymmetry of information the thesis continues and investigates, for the first time, the probability of underpricing a shipping initial public offering.

In conclusion, all the above topics have never previously been investigated in the ship finance literature in a similar approach/methodology as offered by this thesis, thus making its contribution an original source of reference for academics and a useful tool, under similar market conditions as those examined by this thesis, for practitioners.

Chapter 1. Shipping US Public Equities

1.1) Introduction

Since the Second World War the shipping industry, one of the most capital intensive industries, has utilised a wide spectrum of capital sources for financing acquisition of newbuilding vessels and sale and purchase of secondhand vessels. The decision by the shipping company of how to finance its replacement and/or growth plans is very important to the success of the project. In shipping finance there are three main categories of capital sources: Equity finance, Mezzanine finance, and Debt finance. In the case of Equity financing, shipping companies mainly use the following types: the owner's private equity; the company's retained earnings; and equity offerings[1], public or private [including the Norwegian and German tax partnerships of Kommandit-Selskap (KS) and Kommandit-Gesellschaft (KG)]. The main types in the case of Mezzanine finance are: preference shares; warrants; and convertibles. Finally, in the case of Debt financing shipping companies mainly utilise: bank loans (including Islamic finance); export finance; bond issues, public or private placements; and leasing.

The need of capital markets, especially those of New York and London, as a source of finance for shipping companies was first highlighted by Grammenos (1985). Over the years, equity capital markets have played a minor role in the financing of the shipping industry due to a number of factors, such as the reluctance of the owners of the shipping companies to dilute control and disclose information, and the unattractiveness of the shipping industry to the investment community often due to its inability to provide stable profit and income streams. Nevertheless, this reluctance to enter the equity capital markets appeared to fade away during the stock and shipping bull markets of 2003 – 2008. This is well documented by the increase in the number of shipping companies entering the US equity capital markets for the first time or even by the secondary offerings of already listed companies (see table 1-2).

This chapter concentrates on the US equity capital market as a source of finance for shipping companies and gives an overview of this market since it is the largest of its kind. It

[1] Islamic finance is included under equity offerings as well.

discusses important issues for the shipping companies that utilise this market for financing and the investors who invest in shipping equities. Specifically, the paper is structured as follows: section 1.2 provides a discussion about the different methods a shipping company can use in order to tap the US capital markets; the importance of the underwriter; and the three options available to the underwriter when taking a shipping company public. Section 1.3 deals with the possible reasons that may lead a shipping company to seek a public listing and the advantages/disadvantages of such a decision. Section 1.4 provides an overview of shipping stocks issuance volume trends in the US for the period 1987-2010. The factors that may affect the pricing and long run performance of shipping stocks are discussed in section 1.5; and finally, section 1.6 concludes the chapter.

1.2) Equity Offerings and the Underwriter

An equity public offering is a sale of equity securities made available publicly by already listed companies or companies about to be listed (initial public offerings) on stock exchanges.

The first step for a shipping company willing to enter the equity capital markets is to hire an underwriter. The underwriter, usually an investment bank, may also perform the sponsor's functions but its chief role is to underwrite, price and distribute the issue. The underwriting function refers to undertaking the risk of adverse price fluctuations during the issue distribution period in return for a fee. Thus, the underwriter's reputation is at stake if the flotation fails, and in the case of the firm commitment method – which it is discussed in the following paragraph – the underwriter may also incur a financial loss. The reputation of the underwriter is of paramount importance for both the investment bank and the issuer. Investment banks invest in reputation because it facilitates the conduct of premarket activities and generates more business, hence higher fees. At the same time, issuers concerned about price adjustments prior to the offer date are willing to pay for the reputational service as they may benefit from more efficient premarket activities (Logue et al., 2002; Chang et al., 2010). For large issues – in terms of the amount raised – the risk is normally spread through an underwriting syndicate (made up of financial institutions and brokerage houses) which carries out the distribution function, by selling through its own network of banks and stockbrokers.

Regarding the issuing method, there are three different types of agreement. The first one is the Firm Commitment where the underwriter agrees to purchase the entire issue from the issuer and then re-offer it to the general public. With this type of agreement the underwriter has guaranteed to provide a certain amount of cash to the issuer and the risk of the issue falls entirely upon the underwriter. If the underwriter fails to sell the amount of the securities being purchased, the agreed sum of money still has to be paid to the issuer. The second type of agreement is known as Best Efforts agreement where the underwriter agrees to sell the securities for the issuer but does not guarantee the amount of capital to be raised by the issue. Finally, book-building is the third type of agreement and the most commonly used in shipping. Book-building refers to the collection of bids from investors, which is based on an indicative price range, and the issue price being fixed after the bid closing date. The principal players involved in a book building process are the Book Running Lead Manager (BRLM), the syndicate members – who are appointed by the BRLM –, the shipping company, and the potential investors. The book-building process is undertaken basically to determine the investor's appetite for the shares at a particular price range. It is undertaken before making a public offering and it helps to determine the issue price and the number of shares to be issued.

Regarding experience, size and prestige, there is a wide range of underwriters and in order to find the one best suited to its needs, the shipping company could turn for advice to lawyers and accountants. It is useful to find an underwriter who has done previous initial and secondary public offerings of shipping companies. Underwriters who have done other successful initial public offerings in the industry of the issuer are more familiar with the structure of the industry, pricing the issue should be easier, as selling the offering to a syndicate, and finally, they will already have worked or are working with analysts covering the industry (Logue et al., 2002). It is also vital that the selected underwriters should be able to put together a strong syndicate and the desirable choice is to have a broad base of institutional and individual investors over many different capital cities (geographical spread). Furthermore, good underwriters support the stock for several weeks after the offering date and they provide buying in the aftermarket to support the price – this is perfectly legal and

incorporated as part of the underwriting agreement. Finally, analyst's coverage subsequent to the offering is important as analysts maintain an information flow about the company and the industry to the investing public; thus, it is beneficial for all major players in an IPO, i.e. the underwriters, the issuer and the investors.

Apart from initial and secondary public offerings, different methods of tapping the US equity capital markets also include the "Special Purpose Acquisition Company" (SPAC) method and the "At-the-Market" (ATM) method[2]. A Special Purpose Acquisition Company (SPAC) is a pooled investment vehicle that allows public stock market investors to invest in private equity type transactions, particularly leverage buyouts. SPACs are shell or blank-check companies that have no operations but go public with the intention of merging with or acquiring a company with the proceeds of the SPAC's initial public offering. SPACs can be industry specific or general and typically have eighteen months to complete an acquisition. If not successful the remaining cash held in trust by the SPAC must be returned to investors at that time. For practical purposes 80% of investors must approve a target acquisition. A SPAC is a fully reporting public company generally listed on the Over the Counter Bulletin Board (OTCBB). However, when an acquisition is made, a listing application is filed for listing on the American Stock Exchange (AMEX), the National Association of Securities Dealers Automated Quotations (NASDAQ) or the New York Stock Exchange (NYSE) as appropriate.

An at-the-market (ATM) offering involves the sale by an issuer of equity securities into the market periodically over time, typically at the prevailing market price, through a placement agent, or designated broker-dealer. Pursuant to a distribution or sales agreement with the broker-dealer, the issuer maintains complete control over when securities are sold, the amount sold, and the minimum price at which they may be sold. The broker-dealer is paid a commission on the securities sold, and the issuer may stop the offering at any time. Because there is no lock-up period, the issuer is generally free to pursue a traditional deal if it desires while still keeping the at-the-market program in place.

[2] Examples of shipping companies that entered the equity capital markets via the SPAC method include: International Shipping Enterprises, Freeseas Inc. and Star Maritime Corporation. Examples of the ATM method are: Dryships Inc., Eagle Bulk, Paragon Shipping, and Euroseas 2009 offerings.

1.3) Reasons to Go Public, Advantages and Diasdvantages

In certain parts of 1970s, 1980s and late 2000, one of the major causes of oversupply has been the liberal availability of debt finance for new-buildings from providers of credit and the corresponding willingness of shipowners to become excessively geared. This policy proved successful for shipping companies in prosperous markets when the return on assets exceeded the cost of debt, and was reflected in the rapid fleet expansions, particularly in the 1967/1973 and 2003/2008 periods. However, the shipping crises of the 1970s, 1980s, and to a certain extent in 2008/9, resulted in severe debt servicing difficulties and an erosion of the industry's equity base. Consequently, the importance of less traditional shipping finance sources – such as the capital markets – started emerging in the second part of the 1980s and became apparent in the 21st Century. The main reasons are: (1) the temporary difficulty of the banking system to provide on time the necessary funds for newbuilding and/or second-hand purchases; this happened during the banking crisis of 1982-85 and the world financial crisis of 2008-2010; (2) the depletion of the equity base of shipping companies in the mid-1980s; (3) the recent large scale vessel replacement programme; (4) the high vessel prices in 1999s and 2000s; (5) the emergence of a new generation of shipowners with a different academic background and more liberal philosophy towards the ownership of the vessel; (6) the need to increase the size of the shipping companies. The last reason gives the opportunity to shipping companies to increase their market share, improve their customer relations, utilise their fleet better, improve their financial flexibility, have greater economies of scale, and finally reduce their overall cost of finance. Panayides and Gong (2002) have also outlined the importance of M&As directed in achieving the financial, economic and strategic objectives of shipping companies, and their impact directly and immediately on the value of the company.

Table 1-1: Average Gross Proceeds and Company Size According to the Primary Reason for Going Public

Purpose of Issue	No.of Offers(%)	Average Gross Proceeds	Average Size of Company
Vessel Acquisition	19(63%)	$58,949,220	$152,634,410
Asset Play	7(24%)	$61,199,180	$71,891,235
Debt Repayment	3(13%)	$61,726,890	$203,139,845
Trading Activities	1(3%)	$48,103,845	$152,634,410

Source: Grammenos and Marcoulis (1996b).

Grammenos and Marcoulis (1996b) – in the first ever paper on shipping IPOs – document that during the period 1983 to 1995 the number and size of shipping companies entering the equity capital markets has increased. According to the results of the study, shown in table 1-1, companies entering the equity markets for debt repayment purposes appear to be on average larger in size than those entering the equity markets for vessel acquisitions purposes. In addition, vessel acquisition appears to be the main purpose for going public (63%) followed by asset play (24%). Debt repayment (13%) constitutes another purpose for going public, with only one company deciding to go public for trading activities. On a similar note, in the finance literature, the IPO decision as a strategic move to raise equity financing for growth purposes has also been highlighted by Chemmanur and Fulghieri (1999), and, Maksimovic and Pichler (2001). Kim and Weisbach (2008) find that funds raised by an IPO are used for several purposes in addition to financing growth, such as rebalancing leverage and increasing cash balances. Furthermore, Brau and Fawcett (2006) examine four issues[3] related to initial public offerings using a survey of 438 chief financial officers (CFOs), and find that CFOs regard initial public offerings as vehicles for funding the company's growth and for developing liquidity. In addition, CFOs are concerned with the direct costs of taking the company public, for example underwriting fees[4], but they are even more concerned with the indirect cost of loss of confidentiality. So, what are the advantages and disadvantages of taking a shipping company public?

The fundamental advantage of going public is the reduction of financial risk by obtaining the finance required without the use of debt finance and the corresponding obligations it entails. In contrast to debt interest and principal repayments, the company has no obligation to pay shareholders' dividends. Additionally, equity finance through public offerings may pave the way for prudent injections of debt, since the equity raised results in lower gearing levels; Huyghebaert and Hulle (2005) argue that an IPO allows the company to

[3] 1) why do firms go public? 2) is CFO sentiment stationary across bear and bull markets? 3) what concerns CFOs about going public? and 4) do CFO perceptions correlate with returns?

[4] Chen and Ritter (2000) present evidence that gross spreads on IPOs are clustering at seven percent, with the concentration of seven percent spreads increasing during the 1990s. They argue that a possible explanation for the clustering of spreads at seven percent is collusion. If underwriters compete for business on the basis of spreads that they charge, competition will drive the spread to the cost of providing the services. On the other hand, if underwriters agree to form a cartel, then they can increase their profits and a pricing mechanism would be needed to decide how much to charge; an arrangement would be to agree to always charge the same fees (seven percent), with the profits shared among the syndicate.

enhance its financial flexibility by generating additional sources of capital to finance its growth and expansion. When a company prospers and needs additional capital, it may find it desirable to go public by selling shares to a large number of diversified investors. Once the stock is publicly traded, this liquidity allows the company to raise additional capital on more favourable terms.

Public offerings also enhance the share liquidity of the company, which in turn, may positively influence the company's market value [Amihud and Mendelson, 1986]. Sufficient liquidity in the equity market can be a prerequisite for raising further (even non-equity) capital. Indeed, an important explanation of why an active market can help in obtaining further finance is that the equity price acts as a signal of the company's value. On the other hand, once the company gets a listing, listed shares may be used as collateral for future loans or incentives for employees. Bancel and Mittoo (2009) find evidence that family-controlled companies view IPOs as vehicles to strengthen their bargaining power with creditors without relinquishing control.

Furthermore, a successful[5] public offering and stock exchange listing will result in the company improving its reputation and gaining prestige[Bancel and Mittoo, 2001], increase of market coverage [Cook et al., 2006; Frieder and Subrahmanyan, 2005], and transfer of monitoring costs from the lenders to the stock exchange authorities. Mourdoukoutas and Stefanidis (2009) surveyed 10 Greek shipping companies that are listed on a US stock exchange and find that a public listing has met and exceeded the Chief Executive Officers (CEOs)[6] expectations in regards to the following advantages: broadening and diversifying capital financing, improving the image and prestige, strengthening their bargaining power with creditors, and enhancing their entrepreneurial opportunities. Finally, a stock exchange listing also results in tighter control over the company, which reduces the probability of fraudulent actions of management.

[5] Many factors play a role into an IPO's success. The most important of these is the company's expected market capitalisation. However, even a highly anticipated market capitalisation does not guarantee a successful IPO. Other factors that affect an IPO's success include the corporation's popularity in its industry, the timing of the offering relative to financial market activity, the competitiveness of the stock's price to comparable stocks, the company's growth potential, and the reputation and ability of the underwriter.

[6] The questionnaire of the survey was filled in by the CEOs of the companies and only in three cases the questionnaire was filled in by the CFOs.

Thus, for a number of shipping companies the emphasis of finance has shifted from the traditional means of financing, such as bank loans and equity investments by family members and private investors to the Anglo-Saxon-style of capital market financing.

On the other hand, a major disadvantage of going public is the possibility that the company's existing shareholders may lose the managerial control of the company. Relevant information will have to be furnished regularly [Pagano and Roell, 1998] and such information is likely to cover sensitive areas such as salaries and terms of vessels' employment (Grammenos, 1994; 2010). Similarly, the management's job becomes onerous and less flexible e.g. executive time for shareholders. Furthermore, once the company's shares are traded publicly, its market price is influenced by external factors which are out of the management's hand, such as the performance of stock exchanges. In addition, there are substantial one-time costs[7] associated with initial public offerings [Chen and Ritter, 2000; Hansen, 2001] and the income generated by the listed company is shared with the new common shareholders in contrast to the case of a private independent company. Nevertheless, Bancel and Mittoo (2009) find that CFOs express less concern about the costs, and perceive benefits to be significantly higher than the costs of going public.

1.4) US Shipping Equities 1987-2010

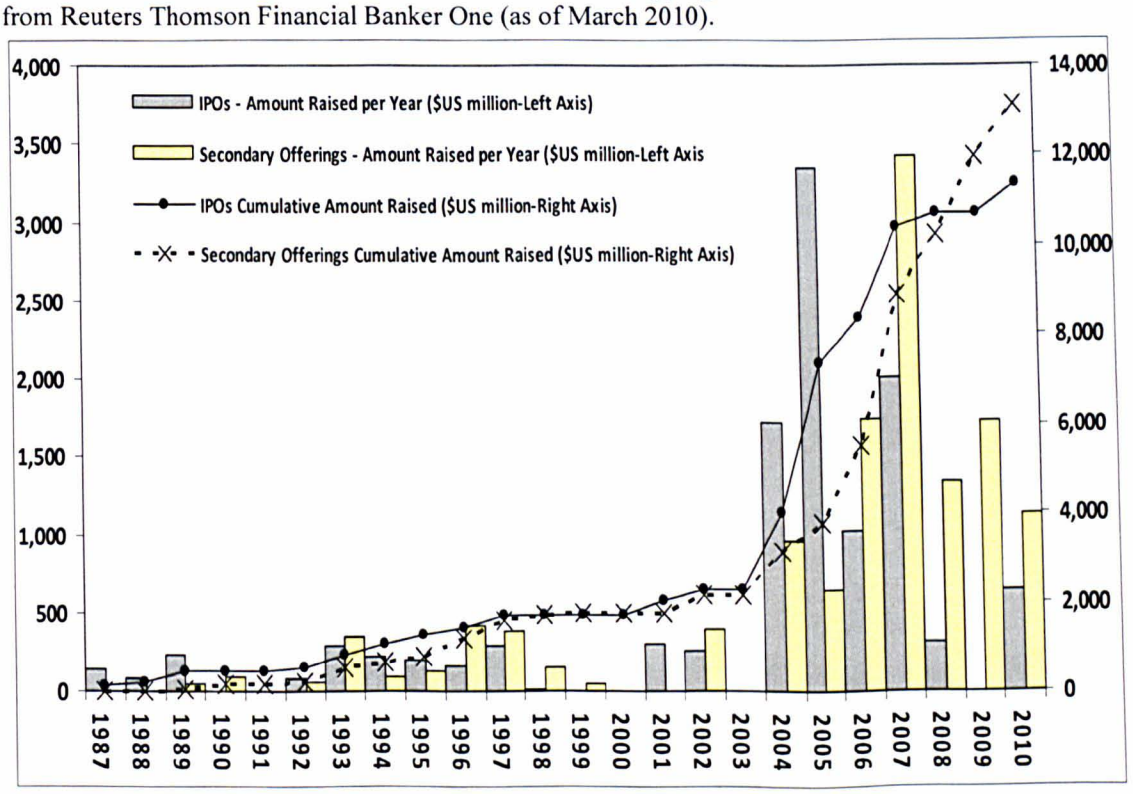
At the beginning of the second part of the 1980s an interesting experiment took place. Seven newly established shipping companies raised funds in the US public capital markets. It was a period during which the capital base of shipping companies, as mentioned previously, had been depleted; banks were financing a smaller percentage of the vessel's market value – approximately 50-60 percent; while a number of banks had abandoned financing the shipping industry. These companies, most of which became public growth companies in 1987-1992, were established as limited life companies. This means that a liquidation of the company would take place provided that the vessel's market value would have increased; otherwise, the

[7] Grammenos and Marcoulis (1996b) have documented that the direct costs of shipping companies going public are on average 7.89% of gross proceeds and the indirect costs (underpricing) are 5.32% on average. The direct costs (defined as the difference between net & gross proceeds of the issue reported in the prospectus – the overallotment option is not taken into account in these calculations) include the legal, auditing, advertising and road show expenses and underwriting fees. The indirect costs are the management time and effort devoted to conducting the offering, and the dilution associated with selling shares at an offering price that is, on average, below the price prevailing in the market shortly after the IPO. This phenomenon is known in the finance literature as underpricing of the initial public offerings.

life would have been extended until the right time has come. Their goal was to exploit the expected rise of the shipping market, materialise capital gains, and also make operational profits; whereas, the promoters (issuers of shares) and managers of these companies were going to get rewarded according to a distribution scheme (approximately one third of the operating profits and capital gains).

Many of these companies failed because the anticipated shipping boom, mainly in the tanker sector, did not take place and, as a result, they could not meet the expected targets/returns of investors. In addition, the vessel's repair and maintenance costs proved much higher than projected, while at the same time insurance premia soared. However, this pioneering method attracted the interest of a generation of younger shipowners who at a later stage between 1993-1997 and 2004-2007, were to raise substantial funds – through growth companies this time – from the international equity capital markets.

Figure 1-1: US Shipping IPOs and Secondary Offerings 1987 – 2010
Source: The Costas Grammenos International Centre for Shipping, Trade & Finance; Data collected from Reuters Thomson Financial Banker One (as of March 2010).



As it is evident in figure 1-1, equity offerings by shipping companies in the US have experienced a strong period of initial public issuance during 2004-2007 with 2005 being the best year in the history of the shipping IPOs listed in the US. In total, shipping companies raised $3.35 billion in that year by entering the equity capital markets for the first time. Overall, for the period 1987-2010, shipping companies have raised $11.37 billion by initial public offerings. Similarly, secondary offerings by shipping companies experienced a boost after 2004, with 2007 being the best year. In total, secondary offerings by shipping companies have reached $13.12 billion during the period 1987-2010. Let us now have a closer look at the issuance trends that the shipping US equity capital markets have experienced.

Table 1-2: US Initial Public Offerings and Secondary Offerings Statistics 1987 – 2010 (as of March 2010)
Source: The Costas Grammenos International Centre for Shipping, Trade & Finance; Data collected from Reuters Thomson Financial Banker One.

	ALL US EQUITY - IPOs				US SHIPPING IPOs				ALL US EQUITY - SECONDARY OFFERINGS				US SHIPPING SECONDARY OFFERINGS			
Year	Amount Raised ($million)	% of Total Amount Raised	No of Issues	Average Amount Raised per Issue ($million)	Amount Raised ($million)	% of Total Amount Raised	No of Issues	Average Amount Raised per Issue ($million)	Amount Raised ($million)	% of Total Amount Raised	No of Issues	Average Amount Raised per Issue ($million)	Amount Raised ($million)	% of Total Amount Raised	No of Issues	Average Amount Raised per Issue ($million)
1987	28,872.42	2.10%	676	42.71	139.44	1.23%	2	69.72	31,692.16	1.16%	554	57.21	0.00	0.00%	0	0.00
1988	27,130.70	1.97%	340	79.80	82.50	0.73%	2	41.25	19,866.69	0.73%	430	46.20	0.00	0.00%	0	0.00
1989	15,165.47	1.10%	278	54.55	232.95	2.05%	5	46.59	33,165.70	1.22%	548	60.52	50.95	0.39%	1	50.95
1990	15,235.45	1.11%	295	51.65	0.00	0.00%	0	0.00	24,577.48	0.90%	434	56.63	92.39	0.70%	2	46.20
1991	28,632.90	2.08%	457	62.65	0.00	0.00%	0	0.00	45,800.55	1.68%	702	65.24	0.00	0.00%	0	0.00
1992	48,403.77	3.52%	750	64.54	83.76	0.74%	2	41.88	48,989.48	1.80%	743	65.93	56.76	0.43%	1	56.76
1993	70,932.41	5.15%	981	72.31	289.40	2.55%	3	96.47	65,501.71	2.40%	952	68.80	342.43	2.61%	3	114.14
1994	55,488.59	4.03%	943	58.84	221.90	1.95%	3	73.97	58,046.09	2.13%	804	72.20	89.85	0.68%	2	44.93
1995	42,020.60	3.05%	694	60.55	200.55	1.76%	2	100.28	79,450.60	2.91%	863	92.06	128.69	0.98%	2	64.35
1996	68,553.57	4.98%	1,093	62.72	162.96	1.43%	3	54.32	110,704.32	4.06%	1113	99.46	418.13	3.19%	4	104.53
1997	54,238.80	3.94%	794	68.31	288.65	2.54%	2	144.33	123,293.94	4.52%	999	123.42	382.05	2.91%	3	127.35
1998	66,965.41	4.87%	632	105.96	12.00	0.11%	1	12.00	144,465.35	5.30%	942	153.36	145.25	1.11%	1	145.25
1999	82,468.65	5.99%	726	113.59	0.00	0.00%	0	0.00	161,889.89	5.93%	772	209.70	50.00	0.38%	1	50.00
2000	98,190.86	7.13%	780	125.89	0.00	0.00%	0	0.00	197,255.60	7.23%	749	263.36	0.00	0.00%	0	0.00
2001	48,235.39	3.50%	199	242.39	304.25	2.68%	3	101.42	144,096.96	5.28%	723	199.30	0.00	0.00%	0	0.00
2002	53,952.51	3.92%	250	215.81	257.88	2.27%	3	85.96	114,445.59	4.20%	681	168.06	394.04	3.00%	5	78.81
2003	51,505.82	3.74%	180	286.14	0.00	0.00%	0	0.00	103,012.98	3.78%	772	133.44	0.00	0.00%	0	0.00
2004	103,887.21	7.55%	473	219.63	1723.93	15.17%	8	215.49	141,255.56	5.18%	890	158.71	954.44	7.27%	7	136.35
2005	77,002.22	5.59%	393	195.93	3353.69	29.50%	17	197.28	162,713.31	5.96%	767	212.14	643.71	4.90%	7	91.96
2006	91,123.16	6.62%	383	237.92	1033.30	9.09%	6	172.22	178,605.12	6.55%	860	207.68	1740.35	13.26%	12	145.03
2007	134,241.50	9.75%	549	244.52	2012.59	17.70%	9	223.62	207,617.80	7.61%	906	229.16	3423.94	26.08%	29	118.07
2008	55,256.98	4.01%	201	274.91	315.00	2.77%	2	157.50	232,609.20	8.53%	462	503.48	1342.03	10.22%	9	149.11
2009	52,018.76	3.78%	187	278.18	0.00	0.00%	0	0.00	256,134.64	9.39%	732	349.91	1735.24	13.22%	19	91.33
2010	6,771.70	0.49%	53	127.77	653.05	5.74%	3	217.68	42,750.35	1.57%	213	200.71	1136.60	8.66%	13	87.43
1987-1999	**604,108.74**	**43.89%**	**8,659**	**69.77**	**1,714.11**	**15.08%**	**25**	**68.56**	**947,443.96**	**34.73%**	**9,856**	**96.13**	**1,756.50**	**13.38%**	**20**	**87.83**
2000-2010	**772,186.11**	**56.11%**	**3,648**	**211.67**	**9,653.69**	**84.92%**	**51**	**189.29**	**1,780,497.11**	**65.27%**	**7,755**	**229.59**	**11,370.35**	**86.62%**	**101**	**112.58**
Total	**1,376,294.85**	**100.00%**	**12,307**	**111.83**	**11,367.80**	**100.00%**	**76**	**149.58**	**2,727,941.07**	**100.00%**	**17,611**	**154.89**	**13,126.85**	**100.00%**	**121**	**108.49**

Table 1-2 is categorised by year, overall, and shipping companies and shows statistics for the initial and secondary public issues in the US equity markets for the period 1987-2010. Shipping initial public offerings activity was at its highest levels during the years 2004 to 2007 - in percentage terms as of the total amount raised; in particular, year 2005 accounts for 29.50 percent of the total amount raised by shipping companies through initial public offerings. Similarly, secondary offerings by shipping companies experienced a boom from 2006 to 2009, with 2007 accounting for 26.08 percent of the total amount raised through secondary offerings. Furthermore, when the sample is split into two periods, 1987-1999 and 2000-2010, it can be observed that issuance activity for IPOs and secondary offerings in the second period accounts for 84.92 percent and 86.62 percent of the total respectively.

The main reasons for the increased issuance activity in shipping initial and secondary offerings in 2004-2007 were: 1) the general investment sentiment was very good as the world economy had come out of the 2000-2003 downturn and tapping the equity public markets was easier than before; 2) the shipping market conditions - especially in the dry bulk sector - were very good; 3) the need for funds to finance the overall fleet expansion programme (see table 1-3) due to the growing Chinese economy, which was perceived as a factor to increase the demand for seaborne trade; and 4) the appetite of investment banks towards a fee generating income by completing equity offering deals was high. Generally, if the shipping initial public offerings are compared to the overall US initial public offerings for the period 2004-2007 it can be argued that the issuing activity coincides and fits well with the hot issue puzzle. Ibboston and Jaffe [1975] originally documented the hot issue puzzle where there is a cyclical pattern in the IPO market. Ritter [1984] extended this study and found that hot issue markets continue to exist. Hot and cold markets are defined on the basis of the monthly IPO volume [Bayless and Chaplinsky, 1996; Helwege and Liang, 2004; Alti, 2006,] and it can be argued that the hot issue market phenomenon also applies in the case of shipping IPOs for the period 2004-2007.

Another observation is the increase of the average amount raised per issue – on a yearly basis – for the period 2004-2007 – both for the shipping and overall equity initial

public offerings, an observation that does not stands for the shipping secondary offerings. The average amount per issue – for all categories and the whole period 1987 to 2010 ranges between $US108 million and $US155 million, with shipping initial public offerings having an average of $US150 million and secondary shipping offerings an average of $US108 million. For all 4 categories, when the two periods (1987-1999 and 2000-2010) are compared, it can be observed a dramatic increase in the average of the amount raised; thus, it can be argued that issues for the second part (2000-2010) of the sample are larger in size. Overall, shipping equity initial and secondary offerings activity had a dramatic boost for the period 2004 to 2007 and on average the issues offered during this period were larger in terms of the amount raised, i.e. shipping companies entering the US equity capital markets are larger in size, in terms of market capitalisation. The higher volume of shipping IPOs can be attributed to the expansion of the fleet and orderbook during the same period.

Table 1-3 (Panel a): Total World Fleet (DWT million) - March 2010
Source: Clarksons Shipping Intelligence Network

	Tanker		DryBulk		Container		Total (tanker+drybulk+container)	
	DWT	Y/Y %	DWT	Y/Y %	DWT	Y/Y %	DWT	Y/Y %
1998	280,907		264,483		49,281		594,670	
1999	286,019	1.82%	263,772	-0.27%	55,049	11.71%	604,840	1.71%
2000	288,794	0.97%	266,957	1.21%	57,748	4.90%	613,498	1.43%
2001	295,862	2.45%	274,854	2.96%	63,404	9.79%	634,119	3.36%
2002	290,915	-1.67%	286,905	4.38%	71,054	12.07%	648,874	2.33%
2003	295,492	1.57%	294,780	2.74%	78,524	10.51%	668,795	3.07%
2004	303,819	2.82%	302,171	2.51%	85,511	8.90%	691,501	3.40%
2005	320,172	5.38%	322,587	6.76%	93,883	9.79%	736,641	6.53%
2006	343,264	7.21%	345,160	7.00%	106,161	13.08%	794,585	7.87%
2007	363,159	5.80%	368,479	6.76%	123,720	16.54%	855,357	7.65%
2008	385,411	6.13%	392,596	6.55%	140,612	13.65%	918,619	7.40%
2009	406,582	5.49%	417,842	6.43%	158,411	12.66%	982,834	6.99%
2010	441,440	8.57%	475,550	13.81%	171,790	8.45%	1,088,780	10.78%

Table 1-3 (Panel b) Total World Orderbook (DWT million) - March 2010
Source: Clarksons Shipping Intelligence Network

	Tanker		DryBulk		Container		Total (tanker+drybulk+container)	
	DWT	Y/Y %	DWT	Y/Y %	DWT	Y/Y %	DWT	Y/Y %
1998	42.49		69.07		9.92		121.47	
1999	46.10	8.51%	70.45	2.00%	8.20	-17.35%	124.75	2.69%
2000	37.03	-19.67%	70.71	0.37%	11.91	45.33%	119.65	-4.08%
2001	51.01	37.73%	86.66	22.57%	18.38	54.30%	156.05	30.42%
2002	61.24	20.06%	85.40	-1.46%	17.04	-7.27%	163.68	4.89%
2003	58.18	-5.00%	90.34	5.79%	14.04	-17.61%	162.56	-0.68%
2004	76.78	31.97%	132.60	46.78%	32.67	132.60%	242.04	48.89%
2005	86.94	13.23%	155.72	17.44%	45.09	38.03%	287.75	18.88%
2006	87.16	0.26%	162.70	4.48%	54.22	20.25%	304.08	5.68%
2007	150.69	72.88%	255.16	56.83%	57.89	6.78%	463.74	52.51%
2008	168.76	11.99%	421.78	65.30%	78.80	36.10%	669.34	44.33%
2009	182.89	8.37%	506.98	20.20%	72.32	-8.21%	762.19	13.87%
2010	140.71	-23.06%	434.87	-14.22%	55.58	-23.16%	631.15	-17.19%

As it can be observed in table 1-3 (panel a), there was a steady increase in the yearly growth of the fleet after 2004; for example, the combined total fleet of tanker, dry bulk, and container vessels increased by almost 7 percent per year after 2004, whereas the growth rate before was around 3 percent per year. At the same time, shipping companies needed additional capital to finance their fleet expansion which is also evident by the large increase of the orderbook, especially for the periods 2004/5 and 2007/8 (table 1-3, panel b). Furthermore, the increased appetite for secondary shipping equity offerings during 2004-2007 illustrates that, once listed, shipping companies continue to utilise this market as a source of

funding. On the other hand, most of the secondary offerings taking place in 2008/9 were mainly for existing debt repayment purposes.

1.5) Pricing and Long-Run Performance of an IPO

The most researched pattern associated with initial public offerings is underpricing[8]. There is extensive empirical literature documenting the underpricing phenomenon due to its persistence in IPO deals and the fact that it has increased over time. Work on the underpricing phenomenon includes, among others, Ibbotson (1975) who studies the initial performance of newly issued common stocks offered to the public during the 1960s and finds an average initial return of 11.4 percent; Ibbotson et al. (1988) who report an average underpricing of 21 percent for 2,259 firms during 1980-1984; Ritter and Welch (2002) who find an average initial day return of about 19 percent; and more recently Ritter (2009) documents that for the period 1960-2009 the average initial day return for the US IPOs stands at 16.9 percent. The papers conclude that underpricing is a persistent feature of the IPO markets, the magnitude of underpricing changes over time, and finally, undepricing exists in every stock market[9].

Throughout the years different theories have been developed in order to explain the underpricing phenomenon and can be categorised in asymmetric and symmetric information theories (Ritter and Welch, 2002)[10]. Theories based on asymmetric information[11] include the: 1) Winner's Curse theory (Rock, 1986), 2) Information disclosure theory (Benveniste and Spindt, 1989), 3) Principal – agent theory (Baron, 1982), and 4) Signalling theory (Allen and

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[8] Underpricing measures the realised return from the prospectus offer price to the closing price on the first trading day Academics also prefer to measure the amount of "money left on the table", since this is the money actually gained by IPO investors. The "money left on the table" is defined as the number of shares sold at an IPO multiplied by the difference between the first day closing market price and the offer price.

[9] Ibbotson and Ritter (1995) argue that research on IPO underpricing can be traced back in 1963 when the US Securities and Exchange Commission (SEC) undertook a study.

[10] Ljungqvist (2006) has classified the theories into four categories: asymmetric information theories; ownership and control theories, institutional theories; and behavioural theories.

[11] Winner's curse theory is based on informed versus uniformed investors and empirical research on this theory can be found in Keloharju (1993), and Lee et al. (1999). Information disclosure theory is based on the fact that underwriters can obtain information from informed investors during the IPO process; work on this theory includes Hanley (1993), Cornelli and Goldreich (2001, 2003) and, Jenkinson and Jones (2004). The Principal-agent theory assumes that issuers are less informed than underwriters, whereas the Signalling theory assumes the opposite, issuers are more informed than underwriters (Ljungvist and Wilhelm, 2003; Michaely and Shaw, 1994; Welch, 1989).

Faulhaber, 1989). On the other hand, theories that rely on the symmetric assumption[12] include the: 1) Legal liability theory (Tinic, 1988), and 2) Prospect theory (Loughran and Ritter, 2002).

Grammenos and Marcoulis (1996b) is the first ever study to examine shipping initial public offerings. The study investigates 31 international shipping IPOs for the period 1983 – 1995 and the results seem to be in line with the then existing literature as shipping stocks' initial day returns are of the magnitude of 5.32 percent on average[13]. Moreover, gearing is found to be the only explanatory factor and positively affecting underpricing, while for a reduced sample excluding 7 limited life shipping funds, the proportion of equity offered has also explanatory power over the cross-sectional underpricing. Finally, the study gives evidence that the average direct cost of going public is approximately 8 percent of the amount raised.

Cullinane and Gong (2002) investigate the transportation IPOs in the China mainland and Hong Kong and find evidence that freight related IPOs are subject to more severe underpricing than non-freight related IPOs, 104.95 percent and 19.17 percent respectively. Recently, Merikas et al. (2009) investigate global shipping IPOs and find an average underpricing of 17.69 percent. In addition, the study examines factors that may explain first trading day returns and concludes that underpricing is positively related to the age of the firm, the reputation of the stock market, and the market conditions prevailing at the time of the issue; on the other hand, the reputation of the underwriter negatively affects underpricing. On a similar note, Merikas et al. (2010) examine shipping initial public offerings in the US for the period 1987 - 2007 and find an average underpricing of 4.4 percent. It is evident from the ship finance literature that underpricing for the US shipping IPOs is not that high, whereas on a global scale is much higher; with Asian shipping IPOs leaving the most money on the table for investors.

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[12] Legal liability theory assumes that underpricing takes place in order to reduce possible future litigation from investors (Lowry and Shu, 2002). Prospect theory argues that issuers permit underpricing because their wealth gain from the IPO is greater (Ljungqvist and Wilhelm, 2005).

[13] Ritter (2009) has found an average initial day return of 8.1% for the same period.

Another pattern associated with initial public offerings is the poor post-issue performance in the longer term compared to benchmark indices/stocks. Using a sample of 1,526 IPOs that took place in 1975 – 1984, Ritter (1991) finds that, in the three years after going public, stocks significantly underperform against a set of comparable stocks matched by size and industry. Levis (1993) also reports that 721 IPOs in the UK (1980-1988) have an average first day return of 14.3 percent and underperform against relevant benchmark indices during the first 36 months of public trading[14]. Furthermore, Ritter and Welch (2002) arrive at the same underperformance conclusion where the average market-adjusted 3-year buy-and-hold return for the period 1980-2005 is -20.6 percent.

In the case of shipping stocks, Grammenos and Arkoulis (1999) examine the long-run performance of 27 shipping IPOs issued in the stock exchanges of 7 different countries for the period 1987-1995. They find that a portfolio of shipping IPOs underperforms the local stock market indices by 36.79% by the end of their second anniversary of public listing. However, no underperformance is documented when IPO returns are compared to the Morgan Stanley Capital International (MSCI) Shipping Index. Merikas et al. (2009) argue that, in the long-run, shipping IPOs underperform after a 5 month holding period; specifically, using the buy-and-hold abnormal returns (BHARs) as a measurement for performance, the study finds an underperformance of 15.72 percent. Similarly, on a US based sample, Merikas et al. (2010) study the long-run performance of US shipping IPOs and conclude that holding these stocks for a period of 1, 2 and 3 years offers returns of 7.50, 7.73, and 3.26 percent respectively, as measured by buy-and-hold abnormal returns.

The factors that may affect the long run performance of shipping IPOs are investigated by Grammenos and Arkoulis (1999). The study finds gearing to be positively related to the after-market performance, something that can be attributed to the higher rates of return required by investors for taking more risk (normally 15-20% per annum), and to the lower financial leverage of the companies in the secondary market – perceived as a positive signal. On the other hand, fleet age is found to be negatively related to the share performance in the long-run

[14] Other studies include: Brav and Gompers (1997); Gompers and Lerner (2003); and Chan et al. (2004).

– a result not surprising, as operation of older vessels usually involves higher running costs in terms of maintenance and repairs, insurance and oil consumption. Merikas et al. (2010) find the operating history of the company to positively affect its stock long term performance while a reputable underwriter will affect negatively the performance of the shipping stocks. Additionally, shipping stocks performance seems to be positively affected when these are listed in reputable stock exchanges and during hot periods.

The factors that may influence shipping stocks' returns in the longer term have also been investigated by a number of studies. Grammenos and Marcoulis (1996a) - in the first ever paper on shipping capital markets – find that shipping shares' returns are positively related to the financial leverage when this is measured in book value terms[15] (BV), and negatively related to the average age of the fleet whether measured on a per vessel or a per deadweight basis. Stock market beta and the dividend yield are also explanatory factors but not as strong as the two mentioned before. Kavussanos and Marcoulis (2000a, 2000b) also investigate the US transport industry and detect explanatory power of industrial production and oil prices on stock returns.

Grammenos and Arkoulis (2002) provide evidence about the relationships of global macroeconomic sources of risk with shipping returns internationally. The paper suggests that oil prices and laid up tonnage[16] are negatively related to shipping stock returns; and the exchange rate is found to be positively related with the shipping stock returns. Finally, Drobetz et al. (2010) identify the world stock market index, currency fluctuations against the US dollar, changes in industrial production, and changes in the oil prices as long run systematic risk factors that drive expected shipping stock returns.

[15] Regarding leverage the paper made usage of two measures. The first is defined as (BV of Total Assets – BV of Equity) / (MV of Equity) and proposed by – Bhandari L.C. (1998), "Debt-Equity Ratio and Expected Common Stock returns: Empirical Evidence. Journal of Finance, 43, 507-529. The second one (more traditional) is defined as (BV of Total Assets – BV of Equity) / (BV of Equity) and proposed by several authors (see paper for reference).

[16] Laid up tonnage is used as a proxy for the shipping market, as it is closely related to the equilibrium of demand and supply for seaborne trade and hence with the determination of freight rates.

1.6) Conclusion

The utilisation of other sources than the traditional bank finance has been illustrated by the growing importance of public offerings and private placements for the purposes of raising equity in the US capital markets over the second part of the '80s, the '90s and 21st Century. During the last decade, the good shipping market conditions and the growing demand for seaborne trade due to the Chinese economic growth, and the need to finance the fleet replacement and expansion programme, are factors that contributed to the high issuance volume activity in the US equity market.

Developments in the banking sector – such as debt securitisation –, the deregulation of financial markets, advances of technology and innovation, and the trend towards fee, as opposed to interest rate, banking income (particularly in conjunction with more stringent capital adequacy rules[17]) have also been – in the initial stage – major contributing factors. When it comes to external financing, it seems that shipping companies have come through two stages of capital structure; in the 1990s the pecking order theory seems to be dominant in trying to explaining the decision of external financing, whereas, from 2000 onwards the market timing theory seems to be more applicable. Nevertheless, we cannot disregard the world financial crisis of 2008-2010 when the availability of bank finance became very limited, thus, pressurising shipping companies to seek alternative ways of financing.

Overall, shipping equity initial and secondary offerings issuance activity had a dramatic boost for the period 2003 to 2007 and on average the issues offered during this period were larger in terms of the amount raised. Another development is that the concept of the corporate structure has been strengthened, and the companies have become larger in size due to increased profitability, merger and acquisitions which enhances their market value, and their fleet expansion. Their increase in size is also manifested by their total fleet – which is also quite young in age - in deadweight tonnage terms in relation to the total world fleet, which accounts approximately for 9 percent; indicating in that way their importance in the shipping

[17] Central Banks, under the auspices of the Bank for International Settlements (BIS), imposed the Capital Adequacy Rules in 1993; as time passed, weaknesses in the banking system required the re-assessment of the old rules and the imposition of a set of new Capital Adequacy Rules in 2008. Currently, there is talk about a new set again.

industry. Furthermore, the large number of institutional investors holding shipping stocks in their portfolios and the increase of analyst coverage for shipping stocks are indications that shipping stocks and the shipping industry are increasingly regarded by investors as a mainstream investment opportunity rather than a niche sector for just a few specialised investors.

Chapter 2. Shipping High Yield Bonds

2.1) Introduction

The high yield debt market has been providing finance to non-investment grade companies since the late 1970s, especially during the early part of the 1980s and for the larger part of the 1990s. The major centre for the high yield bond market has been the United States and in particular the financial centre of New York. Domestic US and international institutional investors seeking higher yields, as well as companies in need of capital, have fuelled the rapid growth of this market, making it truly global. High yield bonds are defined as those bonds rated below investment grade by the rating agencies; that means BB+ or lower by Standard & Poor's and Ba1 or lower by Moody's Investors Service (see table 2-3 for a description of credit ratings). These bonds are often issued by companies with a high degree of leverage, making the credit quality of their bonds questionable; and the high yield in these bonds comes as compensation for the high risk undertaken by those who invest in them.

The starting point for the high yield debt market was in March 1977, when Lehman Brothers underwrote three single-B rated issues raising $178 million and in April of the same year Drexel Burnham Lambert underwrote a further $30 million of subordinated debentures for Texas International Inc. The era of high yield debt commenced in this way during the late 1970s and, by 1990, the high yield bond market virtually disappeared with one of its main participants, Drexel Burnham Lambert, declaring bankruptcy[1]. Nevertheless, since then, the market has strengthened and it constitutes a large source of financing in the international capital markets arena; in particular, it continued expanding in the first years of the 21st century, benefiting from low interest rates and limited default rates (De Bondt and Marques, 2004).

This chapter concentrates on the US high yield bond market as a source of finance for shipping companies. In particular, section 2.2 discusses high yield bonds and their seniority.

[1] In late 1980s, Drexel Burnham Lambert accounted for about 60 percent of all underwriting in the US high yield bond market (Kricheff and Strenk, 1999). In 1989, the company was under investigation for insider trading and the economy was already slowing down. In February 1990 the company was forced into bankruptcy by its involvement in illegal activities in the junk bond market, driven by its employee Michael Milken.

The anatomy of the US shipping high yield bond market is provided in section 2.3, and the advantages and disadvantages of high yield bonds for shipping companies are discussed in section 2.4. The importance of credit ratings, the pricing of shipping high yield bonds and their probability of default are examined in section 2.5. Section 2.6 deals with the different restructuring options available to shipping companies that may default on their bonds; and section 2.7 concludes the chapter.

2.2) High Yield Bonds and their Seniority

All bonds are debt securities issued by organizations to raise capital for various purposes. When you buy a bond, you lend your money to the entity that issues it. In return for the loan of your funds, the issuer agrees to pay you interest and ultimately to return the face value (principal) when the bond matures or is called, at a specified date in the future known as the "maturity date" or "call date, respectively."

Different terms are used to describe the high yield debt market, such as "junk bonds", "speculative grade bonds" and "high interest bonds". All of these refer to the same concept of high yield bonds.

As the high-yield market has grown, companies have become more creative with the shape and structure of bond issues. The following varieties of issues may be found in the bond market: *"Straight cash bonds"* are the high-yield market's plain vanilla bonds, offering a fixed coupon rate of interest that is paid in cash, usually in semi-annual payments, through the maturity or call date. *"Split-coupon bonds"* offer one interest (coupon) rate in the early years of the bond's life, followed by a second interest rate in later years. Split-coupon issues in which the interest rate increases in later years are al so called step-up notes. *"Pay-in-kind bonds"* allow the issuer the option of paying the bondholder interest coupon by issuing additional bonds for a predetermined period of time. *"Floating-rate and increasing-rate notes (IRNs)"* pay fluctuating or adjusted rates of interest based on an interest rate benchmark or a schedule of payments. *"Extendable reset notes"* give the issuer the option of resetting the coupon rate and extending the bond's maturity at periodic intervals or at the time of specified events. In exchange for these options, the bondholder has the right to sell, or "put," the bond

back to the issuer. *"Deferred-interest bonds"* pay no interest to the bondholder until a future date. *"Zero-coupon bonds (zeros)"* are sold at a deep discount to their face value upon issuance and pay no interest to the bondholder until accreted at maturity. *"Convertible bonds"* may be converted into shares of another security under stated terms. The security is often the issuing company's common stock. *"Multi-tranche bonds"* offer bondholders several tiers of investments within the same issue. Typically, the tiers may vary in their targeted maturities and credit quality.

According to Moody's Investors Service (1995), the seniority of bond holders regarding their claims in the event of the issuer defaulting on its debt obligations is of importance, as it will determine the degree of recovery in such an event. The seniority scale is as follows: **Senior Secured** collateralized by some type of asset, in the case of shipping companies, the vessels. The bondholder has the right to foreclose on the collateral and either liquidates it or transfers it to the bondholder's name. **Senior Unsecured** not backed by assets, and is subordinated, in terms of debt claims, only to senior secured debt. Senior debt, both secured and unsecured, has a claim prior to subordinated debt. Subordinated debt is repayable only after other debt with a higher claim has been satisfied. **Senior Subordinated** referring to non collateralized debt subordinated in right of payment to senior secured and senior unsecured debt. **Structural Subordinated** usually refers to a senior bond of a pure holding company. In this case the bondholder is dependent on the company's dividends from its subsidiaries, which are junior to any senior claims at those entities. In the event of the subsidiary being a bond issuer, the senior bondholder of the holding company, in effect, becomes subordinated to the subsidiaries' bondholders. **Junior Subordinated** is ranked below all the above debentures in terms of claim. For instance, subordinated (or junior) debt holders have a secondary claim on the assets of an issuer in the case of insolvency. As a result, subordinated securities will normally be rated one or two rating categories below senior debt securities to account for the higher expected credit loss after default occurs. Conversely, a secured obligation may be rated one or more rating categories higher than the company's senior/unsecured rating level.

2.3) The Anatomy of the Shipping High Yield Bond Market 1992-2010

The first high yield bond offered by a shipping company took place in 1992 when Sea Containers Ltd. issued $125 million of subordinated debentures; since then, 74 issues have taken place and have raised $13.7 billion. A problem faced by shipping companies entering the high yield bond market is that the shipping industry is characterized as being highly cyclical, volatile, and often highly geared; and this might be a setback for companies that have to make interest and capital repayments in a recessed shipping market.

Due to the above, shipping has created a bad reputation as a result of the heavy losses and the default of shipping bonds in the late 1990s. Several shipping companies (see table 2-1) entered the high yield bond market in 1997/1998 taking advantage of the prosperous market, and when the shipping market conditions deteriorated in the mid-1998 and 1999 their bond issues defaulted. Possible reasons for the default of these companies were the high gearing level of those companies after entering the high yield market, the chartering policy, the age and size of their fleet[2]. These specific characteristics for a number of shipping companies that defaulted in their debt obligations during 1999 can be found in table 6. Furthermore, as noted by Grammenos (1994) "we may have experienced a similar situation like in the 1970s and 1980s, when young, enthusiastic bankers – without shipping experience and knowledge – were wandering around, offering large loans to anyone who was prepared to listen to them. Similarly, in the case of shipping high yield bonds, the investment banking area, with some exceptions, is a candidate for mistakes".

[2] In favourable market conditions, when company's cash flow situation is strong the company's probability of default is low; whereas in unfavourable market conditions when cash flow is tight and the company's gearing is high the probability of the company not meeting its payment obligations is high, i.e. higher probability of default.

Table 2-1: Characteristics of Shipping Companies that Defaulted in 1999
Source: Offering Prospecti; The Costas Grammenos International Centre for Shipping, Trade and Finance

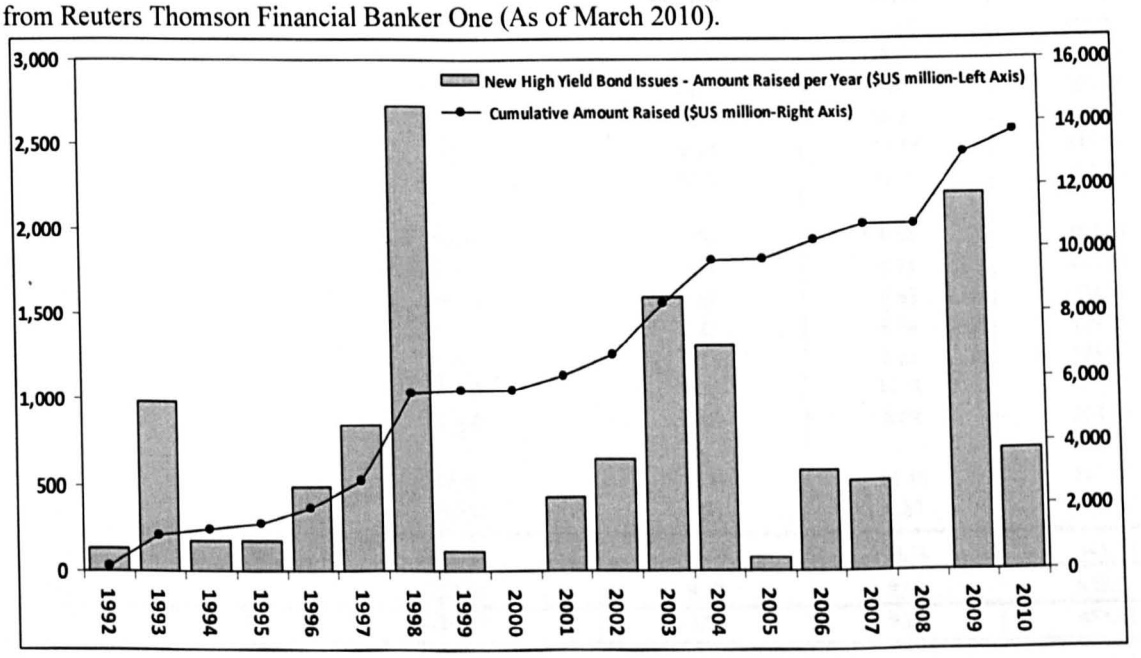
	Gearing after Offering	Spread (bps)	Credit Rating (S&P)	Number of Vessels	Age of Fleet (years)	Chartering Policy
Alpha Shipping Plc	75%	106.00	B-	32	21.5	80% Spot
Ermis Maritime Holdings Ltd	95%	675.00	B	14	20	79% Spot
Global Ocean Carriers Ltd	93%	1390.00	CCC+	13	19.3	85% T/C
Golden Ocean Group Ltd	97%	705.00	B-	28	1.4	54% T/C
Pacific & Atlantic Holdings Inc	123%	610.00	B	27	13.9	60% T/C
PanOceanic Bulk Carriers Ltd	85%	609.00	B	6	11.8	50% Spot
Pegasus Shipping Hellas Ltd	94%	677.50	B	10	18.2	50% T/C
TBS Shipping International Ltd	91%	564.00	B+	25	16.8	68% T/C
Average	94%	667.06	B	19.38	15.36	

Particularly in 1998, much of the global shipping industry experienced recessed market conditions, with freight rates and vessel prices falling dramatically in several shipping sectors. These market conditions led to a downturn in corporate credit quality in the shipping industry, which consequently led several companies defaulting in their high yield bond issues. The Asian (1997) and Russian (1998) financial crises – which were the main reason for the downturn in the shipping market – had an immediate and direct impact on trade, and hit hard several of the shipping sectors. This deterioration of the shipping market troubled many companies, especially those that were highly geared and operated their fleet mainly in the spot market, thus, could not maintain the high interest rate repayments. For instance, in 1999 alone, 10 shipping companies defaulted on their high yield debt. In an article of Lloyd's Shipping Economist (2000) it was mentioned that "the overall public debt default rate by issuer in 1999 was 1.28% compared to the shipping public debt default rate of somewhere around 38%. Though shipping industry issuers represented less than 0.5% of the overall public debt by issuer outstanding as of January 2000, shipping industry defaults totalled nearly 9% of all defaults by issuer for 1999."

Grammenos (2000) in a Lloyds List article predicted that in spite of the battering shipping companies had taken in the high yield bond market, it will present future opportunities for larger and high growth shipping companies with more stabilised cash flow. Similarly, Leggate (2000) examined shipping high bonds and how they are perceived by the European shipping industry as a source of finance. She anticipated that in the next decade the European shipping companies will face large capital requirements due to their fleet replacement

program and an increase in international trade. This need for capital will come at a time when the number of banks willing to finance the shipping industry will contract and, in general, there will be a tightening in credit facilities. The study concludes that the shipping high yield bond market should continue to be an alternative way of financing and that it is largely dependent on the perception of the maritime industry by the investment community.

Figure 2-1: US Shipping High Yield Bonds 1992 – 2010
Source: The Costas Grammenos International Centre for Shipping, Trade & Finance; Data collected from Reuters Thomson Financial Banker One (As of March 2010).



Did we have an end of the shipping high yield bond market era as many thought after the bad period of 1999? Figure 2-1 depicts that there is a re-emergence of the high yield bond market after 2002 where a large number of higher quality companies[3] tapped this market for satisfying their financing needs. Another fundamental change in comparison to the pre-2000 era is that shipping companies entering the high yield bond market are more sophisticated, and have deeper expertise and knowledge of capital markets; either because they have already issued high yield bonds in the past or they have already been publicly listed on a stock exchange. Similarly, investment banks that underwrite the shipping bonds and the credit rating agencies have gained better knowledge and expertise of the shipping industry; have developed their models to assess shipping companies; and in that sense are considered as well equipped compared to the past. Specifically, as we can observe in figure 2-1, there

[3] General Maritime Corporation, Teekay Shipping Group, Overseas Shipholdings and OMI are among those.

was an increased interest for the high yield bond market by shipping companies in the periods 2003-2004, and 2009.

Table 2-2: Shipping High Yield Bond Offerings According to Year of Issuance - (As of March 2010)

	Total Amount raised ($m)	No of issues	Average Amount Raised ($m)	Average Coupon (%)	Average Yield (%)	Average Spread (bps)	Average Credit Rating
1992	125.00	1	125.00	12.50	12.50	500.00	BB-
1993	985.50	8	123.19	9.44	9.43	357.00	BB-
1994	175.00	1	175.00	11.25	11.25	325.00	BB
1995	175.00	1	175.00	10.50	10.50	480.00	BB-
1996	490.00	3	163.33	9.61	9.63	352.67	BB-
1997	849.00	6	141.50	10.17	10.35	623.60	B
1998	2,728.00	17	160.47	10.11	10.27	447.94	B+
1999	115.00	1	115.00	10.75	11.00	475.00	BB-
2000	0.00	0	-	-	-	-	-
2001	425.00	2	212.50	9.75	9.94	483.50	B+
2002	650.00	3	216.67	9.58	9.75	443.00	BB-
2003	1,596.62	8	199.58	9.58	9.62	383.38	B+
2004	1,313.00	8	164.13	8.27	8.34	429.25	B+
2005	75.00	1	75.00	6.13	6.23	195.00	BB-
2006	585.00	3	195.00	11.17	11.79	709.67	B-
2007	520.00	2	260.00	6.00	6.09	203.50	BB-
2008	0.00	0	-	-	-	-	-
2009	2,200.00	7	314.29	10.96	11.46	845.00	B
2010	700.00	2	350.00	9.69	9.87	643.50	B+
1992-2000	**5642.5**	**38**	**148.48**	**10.05**	**10.16**	**448.70**	**BB-**
2001-2010	**8064.62**	**36**	**224.01**	**9.40**	**9.62**	**520.27**	**B+**
Total	**13,707.12**	**74**	**185.23**	**9.74**	**9.90**	**483.52**	**BB-**

Table 2-2 displays the characteristics of 74 US shipping high yield bond issues (1992-2010) by the year of issuance as well as, average coupon, average yield, average spread and average credit rating. It can be seen that a total of $US13,707 million was raised by shipping companies in the speculative grade bond sector during the period 1992 to 2010, with an average coupon, yield and spread[4] of 9.74%, 9.90% and 483 basis points, respectively. Furthermore, the average amount per issue raised during this period was $US185.23 million and had an average credit rating of BB-. Another observation is the low average credit rating assigned to issues during high issuance activity years (with the exception of 1993), hence higher credit spread, where on average in 1997/8, 2003/4 and 2009 the average credit rating was B+/B compared to an overall average of BB-.

[4] The difference between the yield to maturity of the high yield bond and the yield to maturity of a government bond, which is considered riskless, is defined as yield premium/credit spread/spread.

When the issues are separated into two periods, 1992-2000 and 2001-2010, we can observe that the number of issues is almost equal for both periods, 38 and 36 issues respectively; on the other hand, like in the shipping US public equity market, the total amount raised in the 2001-2010 period is larger, with the average amount per issue standing at $US224.01 million compared to $US148.48 million for the 1992-2000 period. In respect to the coupon and yield there are no notable differences between the two periods. Finally, as it appears in table 2-2 the average spread for the 2001-2010 period is slightly higher than in the 1992-2000 period (520 basis points compared to 448 basis points) while the average credit rating is standing at BB- and B+ respectively.

In terms of issuing activity, it is clear that there is high activity concentrated in 1993 (8 issues), 1997-1998 (23 issues), 2003-2004 (16 issues) and 2009 (7 issues). In 1993, interest rates were at low levels and, as a result, the bond market as a whole and the high yield bond market in particular, were very popular. For the period between 1997 and 1998 the main reasons for the high issuance level were the debt repayment/restructuring and the replacement of the fleet, as the companies entering the high yield bond market at that period appeared to have very high gearing levels and old fleets. In 2003-2004, the orderbook for newbuilding vessels had already started to increase due to the upcoming Chinese economy – which was perceived as a boost for the demand of seaborne trade – and the interest rates were set at very low levels; thus, the high activity in the shipping high yield bond market. Finally, in 2009, the shipping market had just come out of a crash in the dry bulk freight rates, and in the tanker freight rates during the first half of 2009. In addition, bank lending had also dried up due to the world financial crisis and many shipping companies, like in 1997/98, had to restructure/ repay existing loans for replacing/expanding their fleet. In fact, all the offering prospecti of the 2009/2010 issues state that the proceeds will be used in order to repay existing debt and in some cases for vessel acquisitions purposes as well. Hence, the renewed interest in the shipping high yield bond market.

The high yield bond market emerges as a source that offers financial flexibility to shipowing companies under conditions of tight banking liquidity. This trend that has been created, is further illustrated by the annual volume of shipping syndicated loans, a relatively

comparable financial source to high yield bonds, which was at a record low of $US 32.9 billion in 2009, remarkably below 2008's figure of $US 85 billion (Marine Money, Freshly Minted, 2010), and reflects the aftermath effect of the 2008-2009 world financial crisis. Investment banks that benefit from the hefty fees for completing high yield bond deals and also by the high coupon that the shipping high yield bonds pay – while at the same time shipowners meet their financing needs but at a higher cost – may also constitute a contributing factor in the issuance of high yield bonds. In particular, shipping companies that had already committed themselves in acquiring newbuilding vessels, but had not closed a deal for a bank credit facility, may have faced difficulties in receiving the necessary funds from a bank after interbank liquidity dried up during the 2008/9 world financial crisis. As a result the high yield bond market was considered as an alternative financing option.

2.4) Advantages and Disadvantages of High Yield Bonds

A survey of managers in shipping companies indicated several advantages to using the bond market (Grammenos et al., 1998). First, the principal is repaid on the date of maturity; hence, the bond issuer is obliged only to pay the interest during the duration of the bond, thereby allowing to divert substantial resources for further expansion if the market conditions allow it and/or to other projects. Second, the long-term maturity of bonds better matches the duration of vessel life than does that of bank loans. Last, but not least, shipping companies that have long-term plans to make equity offerings regard the bond market as an opportunity to gain experience in modern financial-market techniques. Other advantages in raising capital through the high yield bond market making it attractive to shipowners as a method of finance are the following: relatively quick access to funds as it normally takes about three months for a deal to be completed and the company to have the funds at its disposal; provides the company with a diversified source of capital and access to US capital market funds; the shipping company has fewer disclosure requirements in comparison to an equity initial public offering; it is a first exposure of the company to the investors, and by doing so it forces a considerable amount of discipline on the company; a successful high yield bond issue

contributes to the company's credibility and publicity in the market; and finally, the existence of minimal covenant restrictions in comparison to bank syndicated finance.

The high yield bond market has drawbacks, as well. It is a very expensive form of financing in terms of expenditure and time. These expenses include both the initial outlay of capital to complete the bond issue (issuance costs such as underwriting, legal fees, accounting fees, rating and printing), as well as, the high interest payments – in the form of coupons – applied on the total amount of the bond issue and paid till maturity in comparison to syndicated bank loans where interest is applied on the outstanding balance. Another concern for the shipping company is the fact that the amount raised through the bond issue has to be invested rapidly as the interest paid is very high in comparison to the commitment fee paid for the undrawn facility amount in the case of a standby bank loan. Additionally, shipping companies come under closer SEC scrutiny. Other disadvantages when raising capital in the high yield bond market are: the loss of flexibility and lack of personal interface; no public or organized market for the trading of bonds issued in the high yield market, as these bonds are usually available only to Qualified Institutional Buyers and Investors[5] (QIBs); and finally, prepayment is costly.

2.5) Credit Ratings, Yield Premia and the Probability of Default

The question "What is a bond rating?" has been asked at least since 1909 when such ratings were started in the United States. Corporate bond ratings were developed prior to World War I in response to a commercially viable need for independent and reliable judgment about the quality of corporate bonds. At that time, accounting theory and practice, public regulation of many of the financial aspects of enterprises, and the pressures and requirements

[5] In April 1990 rule 144A, adopted by the SEC, enlarged the investor base and created a secondary market for high yield bonds. This secondary market was open only to Qualified Institutional Buyers (QIBs). There are three categories of QIBs. The first one consists of institutional investors, which must own and invest on a discretionary basis at least $US 100 million in securities of issuers that are not affiliated with the entity. The second category consists of banks and savings and loans associations regulated by state or federal law, which in addition to the $US 100 million portfolio must meet a $US 25 million net asset requirement. Finally, the last category consists of security dealers, which are registered under the Exchange Act, and are required to have a portfolio of securities worth above $10 million. The above categories of investors are allowed to resell or transfer the securities within three years after the issuance of a security to the issuer, other QIBs, accredited investors and foreign investors. The secondary trade takes place in the Private Offerings Resale and Trading through Automated Linkages (PORTAL) for trading unregistered securities.

for published financial information, were primitive or minimal as compared with the present situation. The leading persons associated with the development of bond ratings were Roger Babson, Freeman Putney, Jr., and John Moody (Pogue and Soldofsky, 1969).

The main tool in identifying the credit quality of an issue is the rating awarded to the issuer by credit rating agencies. Standard & Poor's and Moody's are the two major US rating agencies, with Fitch being another established rating agency. Credit Ratings are meant to be indications of the likelihood that a company will repay its debt on time, i.e. a measure of credit risk. They are opinions of future relative creditworthiness and provide objective, consistent and simple measures. As such ratings improve the flow of information between lenders (institutional investors/wealthy individuals) and borrowers (issuers). Generally, there is some "information asymmetry" between the borrowers and the lenders because the borrowers know more about their companies than their lenders; thus, ratings agencies help reduce this asymmetry of information. Furthermore, the investors' cost of gathering, analysing, and monitoring the financial positions of the borrowers is also reduced. Accordingly, the overall market efficiency for both borrowers and lenders is improved. Table 2-3 gives a brief description of the rating scales used by Moody's and Standard and Poor's.

Table 2-3: Brief Description of Rating Standards - (see 2.7 Appendix for a full description).
Moody's applies numerical modifiers 1, 2, and 3 in each generic rating classification from Aa through Caa. The modifier 1 indicates that the obligation ranks in the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic rating category. Standard & Poor's applies the plus (+) or minus (-) signs from AA through CCC to show relative standing within the major rating categories. Source: Fabozzi (2005).

Moody's	S&P	Characteristic	Comments	Class
Aaa	AAA	Highest Grade	Maximum Safety	INVESTMENT GRADE
Aa	AA	High Grade	Slightly lower standards	
A	A	Upper Medium	Favorable but possible future problems	
Baa	BBB	Medium Grade	Moderate security and protection	
Ba	BB	Moderate Protection	Contain speculative elements	SPECULATIVE
B	B	Potentially Undesirable	Low assurance of future payments	JUNK BONDS
Caa	CCC	Danger of default	Dangerous elements present	
Ca	CC	Likely in or to default	Highly speculative	
CC	C	Lowest Class	Extremely poor prospects	
C	D	Bottom most grade	Unlikely to attain any standing	
NR	NR	Not Ranked	No evaluation available	

In order to arrive at an opinion as to the credit quality of a shipping company and/or its debt, rating agencies will cover areas of analysis along the lines of 6 Cs of credit analysis (Grammenos, 2002). Specifically, when assessing shipping issues in order to assign a rating, the major credit rating agencies take into consideration the following factors: financial position; operating position; company structure; industry outlook; management quality; sovereign/macroeconomic issues and issue structure [Kindahl (2008); Moody's (2009)].

Assigning a rating is an ongoing analysis providing for the possibility of upgrading or downgrading in line with the company's performance and changing market conditions. They are important in pricing debt securities – Fridson and Garman (1998), Garman (2000), and Gabbi and Sironi (2002) – and assisting investors in their management of credit risk by providing a low cost supplement to an investor's own credit assessment. Ratings are not predictions of a specific or absolute level of credit risk. Their purpose is to provide the investors with an indication of the comparative credit risk of any two investments within the universe of rated instruments. Additionally, ratings keep investors informed in a timely and objective manner of the relative risk of credit loss potential on particular instruments. It should be noted that, ratings are intended to measure credit risk, and not other forms of investment risk such as prepayment risk, liquidity risk, interest rate risk, or currency risk. Moreover, they are applied to all debt and credit-related obligations with initial maturities longer than one year. For short-term debt and related securities (commercial paper, bank deposits, and other money market instruments) a separate rating system is used.

Table 2-4: Shipping High Yield Bond Offerings According to Standard & Poor's Credit Rating Classification 1992 – 2010
Source: The Costas Grammenos International Centre for Shipping, Trade and Finance.

	No of Issues	Total Amount raised ($m)	Average Amount Raised per Issue ($m)	Average Coupon (%)	Average Yield (%)	Average Spread (%)
BB+	7	960.00	137.14	8.52	8.61	321.14
BB	7	1,640.00	234.29	8.87	8.89	336.57
BB-	27	4,496.12	166.52	9.23	9.28	361.89
B+	10	1,975.00	197.50	10.45	10.79	590.80
B	14	2,981.00	212.93	10.78	10.99	614.32
B-	7	1,341.00	191.57	10.79	11.23	687.86
CCC+	2	286.00	143.00	9.63	9.75	1,041.00
Total	**74**	**13,707.12**	**185.23**	**9.74**	**9.90**	**483.52**

Generally, the shipping industry's risk profile, rated as BB [Kindahl, 2008], can be characterized as speculative-grade because of its economic sensitivity, capital intensity, and competitive factors, all of which lead to extremely volatile pricing swings in both freight rates and asset values. Table 2-4 provides evidence on the credit ratings assigned to shipping high yield bond issues for the period 1992-2010. It can be noted that most shipping high yield bonds are assigned a credit rating of BB-. Theoretically, bonds with higher default risk should award the holder with higher returns. Therefore, the yield on bond with higher default risk must be higher than those with less or no default risk. In general, the lower the rating the higher the probability of default and, thus, the higher the spread that the high yield instrument should carry. This can be seen clearly in table 2-4 which shows the average spread for the shipping high yield bond market over the period 1992 - 2010 against the rating awarded. It can be observed that higher ratings are associated with lower spreads on average. This is anticipated as lower grade bonds carry more risk in terms of default compared to bonds with higher ratings.

The determinants of pricing of new high yield bond offerings of shipping companies are investigated by Grammenos and Arkoulis (2003); which is also the pioneer research paper on shipping high yield bonds. The results of the study indicate that credit rating is the major pricing determinant, whereas, gearing and laid-up tonnage (proxy for shipping market conditions) also account for a significant part of price variability. These results support the idea that the market and/or investors undertake its own credit analysis for assessing and pricing high yield bonds offered by shipping companies; it seems that the statistical significance of all three variables in the model points towards a different perception for leverage and market conditions by investors/market and credit rating agencies. Hence, there may be an agency problem related to conflicting interests between rating agencies and their customers, the shipping companies, who are the issuers of the high yield bonds.

Once a shipping high yield bond is issued, its yield premium may change depending on several factors that can be categorised as company specific factors, industry specific factors and macroeconomic factors. Modelling yield premia both in aggregated and desegregated

forms involves identifying these factors and measuring their impact on the dynamics of yield premia. Although there have been several studies on the determinants of yield premia on bonds in other industries/markets (Alessandrini, 1999; Collin-Dufresne et al., 2001; Bedendo et al., 2004), there has been only one study on the dynamics of yield premia on shipping high yield bonds.

Grammenos, Alizadeh and Papapostolou (2007)[6] investigate the dynamics of seasoned shipping high yield bonds. The results of the study suggest that the yield premia of shipping high yield bonds will be wider – all other things being equal – the lower the credit rating and the lower the shipping market earnings are. The statistical significance of credit rating and shipping earnings at the same time – which is in line with the Grammenos and Arkoulis (2003) study[7] - may be explained in two different ways. Hand et al. (1992) and Kisgen (2006) suggest that credit ratings may respond slow to new information, but they are clearly a focal point for financial markets; similarly, we can argue that credit ratings are not normally adjusted to immediately reflect shipping market changes and investors do look at the shipping market closely even though it is incorporated in the credit ratings. Another explanation may be the importance that investors base on the cash flow stability of the company, hence, the need to constantly monitor the shipping market.

The yield premia of shipping high yield bonds will also be wider throughout the passage of time until maturity (Grammenos et al. 2007); a result that contradicts Fons (1994) who argues that the more a speculative company has been in the debt market the lower the yield premium should carry, but in line with the study of Helwege and Turner (1999). A possible reason for this may be the highly cyclical nature of the shipping industry; for instance, the bad shipping market conditions of 1998/9 led a number of shipping bonds to default, and as a result, higher yield premia may also be the outcome of a slow process of regaining the confidence of investors and credit rating agencies. Finally, changes in the yield of 10 year

[6] Grammenos et al. (2007) is complementary to the Grammenos and Arkoulis (2003) study; the 2007 study examines the dynamics of yield premia for seasoned shipping issues whereas the 2003 study investigated the yield premia on the primary pricing only.

[7] The difference is that the Grammenos and Arkoulis (2003) study uses laid-up tonnage as a proxy for the shipping market conditions and it is based on data at the time of the issue, whereas, the Grammenos, Alizadeh, and Papapostolou (2007) study is based on a dynamic environment.

Treasury bonds and the yield on the Merrill Lynch single-B index appear to positively affect the yield premia on seasoned shipping high yield bonds.

According to Moody's Investors Service (1995) long-term ratings are also intended to forecast the probability of default, as well as, the likely severity of loss if default occurs. Probability of default refers to the relative likelihood that there will be any difference at all between what investors were promised and what they receive – i.e. a default[8]. In addition, the definition includes "forced exchanges" in which the issuer of the bond or other instrument has offered security holders a new instrument or package of securities containing a diminished financial obligation (i.e. preferred or common stock or debt with a lower coupon or par amount). Overall, long-term ratings can also be viewed as forecasts of the relative degrees of protection that an investor in a particular obligation will enjoy should the issuer face poor economic conditions and other plausible stress situations in the future.

A study by Grammenos, Nomikos and Papapostolou (2008) provides evidence that the probability of default of a shipping high yield bond portfolio may be reduced on average if one selects only high rated bonds. Table 2-5 shows the credit ratings for the 50 issues employed in the study and the issues are categorised in defaulted and non-defaulted issues. As it can be observed, most of the new issues of shipping high yield bonds were assigned a credit rating of double-B when entering the market, with fewer, a credit rating of single-B. Moreover, table 2-5, indicates that 8.82 percent of the double-B rated bonds (BB+, BB, and BB- ratings) in the sample defaulted, compared to 53.30 percent of single-B rated bonds (B+, B, and B- ratings). This indicates that choosing only the higher rated bonds in a shipping high yield bond portfolio may ensure that the probability of default is reduced on average; nevertheless, on an individual issue basis the same assumption may not hold.

[8] Any missed or delayed disbursement of interest or principal, including late payments made within a grace period (specified in the legal documentation associated with the obligation) is defined as default.

Table 2-5: Descriptive Statistics for Shipping High Yield Bonds Ratings
Source: Grammenos, Nomikos, and Papapostolou (2008)

	All Issues (50)	Defaulted Issues (13)		Non-Defaulted Issues (37)	
	Number	Number	% of Group	Number	% of Group
BB+	4	0	0%	4	100%
BB	5	1	20%	4	80%
BB-	25	2	8%	23	92%
Total BBs	**34**	**3**	**8.82%**	**31**	**91.18%**
B+	6	3	50.00%	3	50.00%
B	8	5	62.50%	3	37.50%
B-	1	1	100%	0	0%
Total Bs	**15**	**9**	**53.30%**	**6**	**46.70%**
CCC+	1	1	100%	0	0%
All Issues in Sample	**50**	**13**	**24%**	**37**	**76%**

The same study used a binary logit model to predict the probability of default for high yield bonds issued by shipping companies[9]. The estimated results of the model indicated that higher gearing[10] levels are associated with higher probabilities of default; and the marginal effect of gearing on the likelihood of default is higher when the ratio is 65 percent and above. Similarly, when companies raise an amount that exceeds their total assets by 80 percent or more, then the probability of default will also be high. On the other hand, shipping market conditions, working capital over total assets and retained earnings over total assets are

[9] Altman's (1968) study was the first one to use multivariate discriminant analysis in order to explain the interaction of financial ratios in predicting bankruptcy. Other studies that used the logit analysis approach include (Santomero and Visno, 1977; Martin, 1977; Estrella et al., 1999) where they tried to estimate the probability of failure for banks and the banking system. Studies using accounting ratios to predict bankruptcy for corporate companies include (Collins, 1980), who also made a comparison between discriminant analysis and linear probability models, Platt and Platt (1990), Bernhardsen (2001) who used logit analysis, and Saretto (2004) who applied a simple piece-wise constant hazard model. Finally, Huffman and Ward (1996) have established a logit model for the prediction of default for high yield bonds at the time of issuance.

[9] One of the most important factors affecting the probability of default is the gearing level. Pre-issue gearing is defined as the ratio of long-term debt over the long-term debt and shareholders' equity. It shows at a glance the debt of a company and is a measure of the company's ability to survive in income recession periods. A rising gearing will indicate an increasing reliance upon bank money or other forms of debt for vessel acquisitions, and this may create problems with paying interest and repaying capital if the market conditions deteriorate. Shipping companies with high gearing ratios and unstable income generation, faced survival problems in the early 1980s; while others, defaulted in their high yield debt obligations in 1998/9. However, during high income periods such as in the second part of the 1980s and in 2003/8, highly geared companies substantially increased their revenues and expanded. Naturally, companies operating in the time-charter market may have no difficulties in paying out interest to the bondholders, while companies operating in the spot or in the short term time-charter markets may face severe difficulties in paying them interest, as happened in 1998/9.

[9] In and out – of – sample tests were also performed in order to further test the robustness of the model and indicated that the predictive ability of the model was significant since the model could predict correctly 97.30 percent of the non-defaulted bonds and 92.31 percent of the defaulted bond respectively.

negatively related to the probability of default[11]. Therefore, the results outline the importance of leverage and cash flow stability; thus, shipping companies may be better off if they focus on their income stability – achieved by offering better quality of services in order to attract first class charterers and longer chartering contracts – which consequently, would be adequate to service their debt obligations during bad shipping market conditions.

2.6) Shipping Yield Bond Defaults and Restructuring Options

As mentioned previously, in 1998 much of the global shipping industry experienced depressed market conditions, and freight rates and vessel prices fell dramatically in several shipping sectors. These weak market conditions led to a downturn in corporate credit quality in the shipping industry in 1998, which consequently led several companies in default. When a company defaults on its debt obligation, both issuers and investors with the help of financial institutions have to formulate a restructuring mechanism. Financial distressed shipping companies have three options available to them to continue independent operations: traditional Chapter 11 bankruptcy, prepackaged bankruptcy, and out-of-court restructuring.

Ideally, value maximising companies should choose the restructuring option that results in the least costly resolution of financial distress. According to Tashjian et al. (1996) and Betker (1997), traditional Chapter 11 bankruptcy results in higher costs than prepackaged bankruptcy and out-of-court restructuring. A Chapter 11 has also the disadvantage of potentially wasting corporate assets since the U.S. Bankruptcy Code requires judges to set corporate operating policies and approve all major business decisions. In addition, when a company chooses to restructure its debt through Chapter 11 and this ultimately leads to liquidation, then creditors and shareholders will give up the difference between the company's value as a going concern and its liquidation value by not settling privately. Finally, Chapter 11 creates additional delays in a settlement because of procedural demands placed on managers before taking any decisions. There are, however, several advantages for companies that choose Chapter 11. Under Chapter 11 the company is not obliged to pay any

interest on any of its unsecured debt and fewer creditors are required for its reorganisation plan approval – where in the case of an out-of-court settlement the creditor's unanimous consent is required. In addition, the Bankruptcy Code's automatic stay provision protects the company from creditor harassment until it emerges from bankruptcy.

Firms that choose pre-packaged bankruptcy inherently waive the benefits of the automatic stay provision by negotiating and seeking approval of a reorganisation plan prior to filing. In addition, because firms are under court protection for significantly less time than traditional Chapter 11 companies, and thus protected from creditors for significantly less time, the accrued benefits of an automatic stay are likely to be significantly less. However, because the voting requirements under Bankruptcy Code are the same for both prepakcaged bankruptcy and traditional Chapter 11, forms choosing either of these two restructuring alternatives benefit from not having to seek unanimous consent.

In practice most companies will first try to restructure their debt in an out-of-court settlement and file for Chapter 11 only when an agreement has not been reached (Gilson, 1999). According to a study by Yost (2002), firms are significantly more likely to restructure out-of-court rather than in traditional Chapter 11 bankruptcy when they come from industries with higher market-to-book ratios and when they have a higher ratio of operating income to total assets.

2.7) Conclusions

The shipping US high yield bond market commenced in 1992 and in 1998/99 a number of shipping companies defaulted on their bonds resulting in a sharp decline in volume activity for the next couple of years. However, the recent re-emergence of the high yield bond market, which began in 2009 and continues today, highlights the importance of this market as a alternative source that offers financial flexibility to shipowing companies. This financial flexibility comes with some advantages such as longer repayment horizon, and less strict covenants that a high yield bond issue may entail.

Investment banks may constitute another contributing factor in the recent issuance of shipping high yield bonds. They benefit from the hefty fees for completing high yield bond

deals and also by the high coupon that the shipping high yield bonds pay – while at the same time shipowners meet their financing needs but at a much higher cost. Finally, we cannot disregard the fact that interest rates in the US were at very low levels supporting the issuance of bonds.

While the 2009 statistics for syndicated bank finance show a substantial decrease in the overall annual volume of shipping syndicated loans, bank finance is expected to continue to be in the future the major source of capital for shipping companies. It is a low cost, flexible –and, often, innovative source – adaptable to changing market conditions. A bank may be supportive to a shipping company during lean and fat years of the shipping cycle. However, what may have changed after the world financial crisis is the fact that banks have become more selective with their clientele and they are after medium and above-size shipping companies with a proven profitability track record, with smaller size shipping companies and newcomers facing funding problems.

Finally, research on shipping high yield bonds has highlighted the importance of cash flow stability, which can be achieved by offering better quality services and longer time chartering contracts with first class charterers. Gearing and the shipping market conditions – among others – are also important factors for high yield bonds issues offered by shipping companies. Up to date, there are only four studies on shipping high yield bonds and have examined their initial and secondary pricing, and their probability of default. Going forward more studies will appear in the literature and address different issues regarding shipping bonds in general, including, for instance, the chartering policy and its impact on shipping bonds. High yield bonds re-emerged in the 21st Century and will remain an alternative source of capital to be tapped by shipping companies, not by all shipping companies though, under the appropriate conditions.

2.8) Appendix

Credit Ratings Explanations – Standard and Poor's

AAA
An obligation rated 'AAA' has the highest rating assigned by Standard & Poor's. The obligor's capacity to meet its financial commitment on the obligation is extremely strong.

AA
An obligation rated 'AA' differs from the highest-rated obligations only in small degree. The obligor's capacity to meet its financial commitment on the obligation is very strong.

A
An obligation rated 'A' is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than obligations in higher-rated categories. However, the obligor's capacity to meet its financial commitment on the obligation is still strong.

BBB
An obligation rated 'BBB' exhibits adequate protection parameters. However, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity of the obligor to meet its financial commitment on the obligation.

BB, B, CCC, CC, and C
Obligations rated 'BB', 'B', 'CCC', 'CC', and 'C' are regarded as having significant speculative characteristics. 'BB' indicates the least degree of speculation and 'C' the highest. While such obligations will likely have some quality and protective characteristics, these may be outweighed by large uncertainties or major exposures to adverse conditions.

BB
An obligation rated 'BB' is less vulnerable to nonpayment than other speculative issues. However, it faces major ongoing uncertainties or exposure to adverse business, financial, or economic conditions, which could lead to the obligor's inadequate capacity to meet its financial commitment on the obligation.

B
An obligation rated 'B' is more vulnerable to nonpayment than obligations rated 'BB', but the obligor currently has the capacity to meet its financial commitment on the obligation. Adverse business, financial, or economic conditions will likely impair the obligor's capacity or willingness to meet its financial commitment on the obligation.

CCC
An obligation rated 'CCC' is currently vulnerable to nonpayment and is dependent upon favorable business, financial, and economic conditions for the obligor to meet its financial commitment on the obligation. In the event of adverse business, financial, or economic conditions, the obligor is not likely to have the capacity to meet its financial commitment on the obligation.

CC
An obligation rated 'CC' is currently highly vulnerable to nonpayment.

C
The 'C' rating may be used to cover a situation where a bankruptcy petition has been filed or similar action has been taken, but payments on this obligation are being continued.

D
An obligation rated 'D' is in payment default. The 'D' rating category is used when payments on an obligation are not made on the date due even if the applicable grace period has not expired, unless Standard & Poor's believes that such payments will be made during such grace period. The 'D' rating also will be used upon the filing of a bankruptcy petition or the taking of a similar action if payments on an obligation are jeopardized.

Plus (+) or minus (-)

The ratings from 'AA' to 'CCC' may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories.

c
The 'c' subscript is used to provide additional information to investors that the bank may terminate its obligation to purchase tendered bonds if the long-term credit rating of the issuer is below an investment-grade level and/or the issuer's bonds are deemed taxable.

p
The letter 'p' indicates that the rating is provisional. A provisional rating assumes the successful completion of the project financed by the debt being rated and indicates that payment of debt service requirements is largely or entirely dependent upon the successful, timely completion of the project. This rating, however, while addressing credit quality subsequent to completion of the project, makes no comment on the likelihood of or the risk of default upon failure of such completion. The investor should exercise his own judgment with respect to such likelihood and risk.

*
Continuance of the ratings is contingent upon Standard & Poor's receipt of an executed copy of the escrow agreement or closing documentation confirming investments and cash flows.

r
The 'r' highlights derivative, hybrid, and certain other obligations that Standard & Poor's believes may experience high volatility or high variability in expected returns as a result of noncredit risks. Examples of such obligations are securities with principal or interest return indexed to equities, commodities, or currencies; certain swaps and options; and interest-only and principal-only mortgage securities. The absence of an 'r' symbol should not be taken as an indication that an obligation will exhibit no volatility or variability in total return.

N.R.
Not rated.

Credit Ratings Explanations – Moody's

Aaa
Bonds and preferred stock which are rated Aaa are judged to be of the best quality. They carry the smallest degree of investment risk and are generally referred to as "gilt edged." Interest payments are protected by a large or by an exceptionally stable margin and principal is secure. While the various protective elements are likely to change, such changes as can be visualized are most unlikely to impair the fundamentally strong position of such issues.

Aa
Bonds and preferred stock which are rated Aa are judged to be of high quality by all standards. Together with the Aaa group they comprise what are generally known as high-grade bonds. They are rated lower than the best bonds because margins of protection may not be as large as in Aaa securities or fluctuation of protective elements may be of greater amplitude or there may be other elements present which make the long-term risk appear somewhat larger than the Aaa securities.

A
Bonds and preferred stock which are rated A possess many favorable investment attributes and are to be considered as upper-medium-grade obligations. Factors giving security to principal and interest are considered adequate, but elements may be present which suggest a susceptibility to impairment some time in the future.

Baa
Bonds and preferred stock which are rated Baa are considered as medium-grade obligations (i.e., they are neither highly protected nor poorly secured). Interest payments and principal security appear adequate for the present but certain protective elements may be lacking or may be characteristically unreliable over any great length of time. Such bonds lack outstanding investment characteristics and in fact have speculative characteristics as well.

Ba
Bonds and preferred stock which are rated Ba are judged to have speculative elements; their future cannot be considered as well-assured. Often the protection of interest and principal payments may be very moderate, and thereby not well safeguarded during both good and bad times over the future. Uncertainty of position characterizes bonds in this class.

B
Bonds and preferred stock which are rated B generally lack characteristics of the desirable investment. Assurance of interest and principal payments or of maintenance of other terms of the contract over any long period of time may be small.

Caa
Bonds and preferred stock which are rated Caa are of poor standing. Such issues may be in default or there may be present elements of danger with respect to principal or interest.

Ca
Bonds and preferred stock which are rated Ca represent obligations which are speculative in a high degree. Such issues are often in default or have other marked shortcomings.

C
Bonds and preferred stock which are rated C are the lowest rated class of bonds, and issues so rated can be regarded as having extremely poor prospects of ever attaining any real investment standing.

Note: Moody's applies numerical modifiers 1, 2, and 3 in each generic rating classification from Aa through Caa. The modifier 1 indicates that the obligation ranks in the higher end of its generic rating category; the modifier 2 indicates a mid-range ranking; and the modifier 3 indicates a ranking in the lower end of that generic rating category.

Chapter 3. Factors Affecting the Dynamics of Yield Premia on Shipping Seasoned High Yield Bonds

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3.1) Introduction

Some of the major factors that may have influenced a large number of shipping companies to issue, mainly, equity and debt in international and national – public and private – capital markets over the last twenty years, during which capital markets have increased their presence in the array of sources for shipping finance, are: the increase of the fleet over the same period and the acceleration – through regulations – of replacement; the perceived need for size increase of shipping companies; the unwillingness of the banking industry – the main source for shipping finance – to provide shipping companies with bilateral and syndicated loans beyond a level due to the corresponding increase of credit risk; the need for flexibility of shipping companies in choosing the appropriate source of finance at a particular point in time; and the ever changing conditions in the shipping and financial markets – and consequently in the shipping companies themselves.

The appearance of the shipping industry in the high yield bond market took place in 1992 when Sea Containers Ltd. issued $125 million of subordinated debentures. By 1998, $5,527 million had been raised in the high yield bond market for shipping companies, through 37 issues of various types of high yield notes (see table 3-2). Despite the decline in the number of shipping high yield bond issues after 1999 – mainly due to a number of shipping companies defaulting in their debt obligations – the market has seen an increase of new issues (15 in the US debt capital market during 2003 and 2004) primarily due to the strong shipping market[1].

[1] During bad shipping market conditions – where spreads are high in order to reflect the riskiness of the issues – the costs of issuing new high yield bonds may be high (a shipping company that issues a bond during that period must be in great financial need) and investors are discouraged from investing in shipping high yield bonds. On the other hand, in good shipping conditions the issuance costs may be lower (thus, higher issuance of shipping high yield bonds) and the shipping high yield bond market attracts more investors; although, during periods of prosperity in the shipping market there is a tendency of shipping companies to prefer the equity capital market as a means of raising funds.

Little is known about the factors that affect the pricing and thus the dynamics of yield premia[2] of shipping seasoned[3] high yield bonds. The question of how spreads for shipping high yield bonds are determined in the "secondary market" merits a closer investigation in view of the importance they carry for investors, and for shipping companies as a means of raising funds after the recent revival of the shipping high yield bond market.

The aim of this chapter is to investigate the factors that can explain the dynamics of yield premia of seasoned shipping high yield bonds; thus, complementing the previous study of Grammenos and Arkoulis (2003) that examined factors that affect the yield premia on the primary pricing. As a result, the main difference between the two studies is that the previous analysis of Grammenos and Arkoulis (2003) was based on a static environment whereas the analysis of this chapter is based on a dynamic environment.

This study contributes to the existing ship finance literature in the following ways: first, it attempts to model the changes of credit spreads of shipping high yield bonds in the secondary market, which is of interest to investors and traders since information on changes in yield premia can be used for investment and asset allocation purposes. In general, high yield bond funds diversify their holdings by industry, and transactions do not occur only at the time of issuance; thus, the problem of mispricing - or looking at the wrong explanatory factors – by using the existing models that apply to the overall high yield bond market or only at the time of issuance may be overcome[4]. Secondly, it distinguishes between high yield issues by listed and unlisted companies as well as defaulted and non-defaulted bond issues in order to examine whether there is any difference in the impact of the explanatory variables on the determination of yield premia. Thirdly, in the analysis we also employ a set of macroeconomic and industry related factors.

The chapter is structured as follows: in the next section – section 3.2 – the literature review is laid out; section 3.3 illustrates the methodology used in the analysis and section 3.4

[2] Yield is defined as the percentage rate of return on the bond when the bond is held until maturity. The yield premium is defined as the difference between the yield to maturity on a corporate bond and the yield to maturity on a government bond of the same maturity. Yield premium, yield spread and credit spread are used interchangeably in the text.

[3] Bonds are traded from one investor to another in the "secondary" high yield bond market.

[4] Sorensen and Burke (1986), Kavussanos and Marcoulis (1997) and, Fridson and Garman (1998) have outlined the importance of industry classification.

discusses the data used in the model; section 3.5 deals with the empirical results of the analysis; and finally, the conclusions are in section 3.6.

3.2) Literature Review

According to Collin-Dufresne et al. (2001), although much is known about the yield changes of corporate bonds, there is very limited knowledge about the determinants of credit spread changes; and it is the change in credit spreads rather than in bond yields that is important to institutional investors[5].

Collin-Dufresne et al. (2001) also investigated the determinants of credit spread changes (both on investment and noninvestment[6] grade bonds) and they found that "variables that should in theory determine credit spread changes have rather limited explanatory power. Furthermore, the residuals from their regression were highly cross-correlated driven by a single common factor; and although they took into account and examined several macroeconomic and financial variables as candidate proxies for this common factor, they were still unable to explain it". Joutz et al. (2001) concluded that – for investment and noninvestment grade bonds – there is a long-run relationship between credit spreads and default risk as measured by the level and the slope of the Treasury term structure; however, the relationship between credit spreads and the term structure variables can vary based on the time-to-maturity and credit quality of corporate bonds.

Another study by Alessandrini (1999) on investment grade bonds revealed a negative relationship between credit spread and the level of interest rates, the slope of the term structure, and stock returns. Bedendo et al. (2004) examined the determinants of credit spreads for investment grade bonds and concluded that "treasury yield curves are an important, but not a unique, determinant; both market and idiosyncratic equity variables play a significant role on the credit spread level".

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[5] According to Collin-Dufresne *et.* al (2001), hedge funds often take leveraged positions in corporate bonds while hedging away interest rate risk by shorting treasuries. As a result, their portfolios become extremely sensitive to changes in credit spreads and not bond yields.

[6] Bonds are divided into two categories: investment grade and noninvestment grade (speculated grade or high yield) bonds. In the US the two major rating agencies are Moody's and Standard and Poor's (S&P). Any bond that has a rating of BBB- and above, assigned by S&P or Baa3 and above, assigned by Moody's is regarded as investment grade. On the other hand, bonds rated BB+ and below by S&P or Ba1 and below by Moody's belong to the speculative grade universe. The rating scales for the two major rating agencies are illustrated in table 3-4.

Barnhill et al. (2000) examined the yields on noninvestment grade bond indices and, by utilizing cointegration techniques, they found a long-run relationship between noninvestment grade yields, Treasury securities, and default rates.

A number of studies have also concentrated on examining the determinants of new issue yield spreads – rather than the dynamics – in the overall noninvestment grade sector. Fridson and Garman (1998) identified a number of factors that explained the variance of new issue yield premia in the high yield bond market for the period 1995-1996. Their results suggested that the yield spread of newly issued high yield bonds is sensitive to factors such as credit rating, term-to- maturity, and secondary market yield premia. Their model explained more than half of the variance in the yield spreads, and the factors they employed were easily quantifiable.

Garman (2000) examined the high yield new bond issue pricing in Europe. He found that the majority of variance in the primary pricing[7] of European new noninvestment grade issues could be quantified in a simple four-factor model. His results were comparable to those of Fridson and Garman (1998) for the US high yield market. The significant variables in the Garman (2000) European new issue model include: the bond's credit rating; the secondary market yield spread of the European high yield bonds; the size of the offering; and whether the bond is deferred-interest coupon.

A study by Gabbi and Sironi (2002) analyzed the issuance spreads of Eurobonds and the main results emerging from their analysis are: credit rating is the most important determinant of spreads; bond investors' reliance on ratings increased over the time for their sample period; and finally, while a bond's expected tax treatment represents a relevant factor explaining spreads, the primary market efficiency and the secondary market liquidity appear as poor explanatory variables.

To date there is only one study that has investigated shipping initial offerings in the bond market. Grammenos and Arkoulis (2003) examined the primary pricing of high yield bond offerings in the shipping industry during the period 1993-1998. Their empirical results suggest that – at the time of issuance – credit rating, financial leverage and laid up tonnage, are determinants of the shipping bonds' yield premia.

[7] Primary pricing refers to the determination of the yield premium of the new high yield bond issues.

3.3) Methodology

The estimation approach of our model is the use of panel methodology. Baltagi (2005) lists several benefits and limitations[8] from using panel data estimation methods over time-series and cross-section data methods. According to Baltagi (2005), one of the benefits is that of controlling for individual heterogeneity. Panel data suggests individuals, firms, states or countries are heterogeneous, while time-series and cross-section studies by not controlling this heterogeneity run the risk of obtaining biased results. In the shipping industry, there are variables difficult to measure and quantify on a monthly basis which also differ across individual companies. These may include the quality of managerial capacity, or the company's chartering policy (spot or time-charter). It is this heterogeneity among companies[9] that we are trying to capture by using a fixed effects model.

The Hausman (1978) test to choose between the fixed and random effects specification of the model is used. A central assumption in random effects estimation is that the effects are uncorrelated with the explanatory variables. To test this assumption we performed the Hausman (1978) test which gave a $\chi^2_7 - stat = 7672$, providing little evidence that there is no misspecification and, thus, favoured the fixed effects specification. Additionally, two tests are used to evaluate the joint significance of the cross-section fixed effects by using sums-of-squares (F-test) and the likelihood function (χ^2-test). The two statistic values $F(39,1292) = 53.88$, $\chi^2_{39} = 1293.11$ and the associated p-values of [0.00] and [0.00], respectively, strongly rejected the null hypothesis that the effects are redundant. As a result our fixed effects model equation is:

$$y_{it} = \beta_{1i} + \mathbf{X}_{kit}\beta_k + \varepsilon_{it}, \quad i = 1,2,\mathrm{K},N \text{ and } t = 1,2,\mathrm{K},T \quad (1)$$

where y_{it} is the yield premium of issue i at time period t; $\mathbf{X}_{kit}$ is the set of k variables[10]; $\beta_{1i} = \overline{\beta}_1 + \mu_i$ is the intercept for the ith issue, while $\overline{\beta}_1$ is the mean intercept and μ_i represents the

[8] For a detailed analysis on the benefits and limitations of panel data see Hsiao (2003) and Klevmarken (1989).

[9] There are companies in our sample that have issued more than one high yield bond. The heterogeneity among companies would not be valid in the case we had issues offered by the same company with the same issue date. We control for this by excluding any issues with that characteristic.

[10] Variables in our model are in logarithmic form.

difference from this mean for the *i*th individual capturing the fixed individual effects; ε_{it} is the random error term[11].

3.4) Data Description

The sample includes data for 40 high yield bonds of shipping companies[12] for the period April 1998 to December 2002 in the U.S. market[13,14], and a collection of time series data for the cross-section. Our sample contains shipping companies with prime business in the tanker, dry, container, ferry, and gas sectors; the spread and credit rating for those companies' high yield bonds were collected on a monthly basis from issues of Tradewinds. A variety of factors were tested and the list includes a set of microeconomic, macroeconomic and industry related factors. A detailed description of the variables is shown in table 3-1.

Table 3-1: Variables Description

Short Title	Description	Source
Microeconomic Variables		
Rating	Standard & Poor's Rating Scale (BB+=11.....C=1)	Tradewinds
Term	Term to Maturity (Remaining Months)	Tradewinds
Market Value	Monthly Change in Company's Market Capitalisation Value (%)	Datastream
Industry Variables		
ClarkSea Index	Monthly Change in Clarkson's Earnings Indicator Index (%)	Clarkson Research
Laid-up Tonnage	Month-Over-Month Change of Laid Up Tonnage Dwt (Tanker and Bulk Carriers) (%)	Clarkson Research
Macroeconomic Variables		
Inflation	Month-Over-Month Change on Consumer Price Index – Inflation (%)	Datastream
Interest Rates	Month-over-Month Change in Yield on Ten-Year Treasuries (%)	Bloomberg
Merrill Lynch Single-B Index	Monthly Changes in the Yield on Merrill Lynch Single-B Index (%)	Bloomberg

[11] The error term follows the classical assumption: $\mathrm{E}(\varepsilon_{it}) \sim \mathrm{N}(0, \sigma^2)$.

[12] The original sample was 45 high yield bonds but after eliminating those that: were nonrated; had an extremely high spread compared to the other companies; or observations for the specific company were inadequate, we obtained a final sample of 40 issues.

[13] The reason we examined the period April 1998 to December 2002 was purely due to the availability of data. The main source of collecting our data (Tradewinds) stopped providing the credit rating for the individual bond issues on a monthly basis after December 2002 up to April 2005. As result, it was not possible to run our model without the credit rating as it constitutes a major explanatory variable for explaining the dynamics of yield premia for shipping high yield bonds.

[14] The reasons we concentrated only on U.S. shipping high yield bonds are the following: the U.S. high yield bond market is much larger in comparison to the European one (for the period 1999-2005 the new issues amount in the U.S. totaled to $601 billion where in Europe only to $105 billion – Source: Bloomberg); furthermore, the number of shipping high yield bonds in Europe is very limited and a comparison with the U.S. shipping high yield bonds could not be made; finally, there are only a couple of investment grade bonds and the rating – as assigned by Standard and Poor's (Source: Standard and Poor's Rating Direct) – of the overall shipping industry is BB, that is to say it belongs to the group of sectors that according to Standard and Poor's "an obligation rated BB is less vulnerable to non-payment than other speculative issues. However, it faces major ongoing uncertainties or exposure to adverse business, financial, or economic conditions, which could lead the obligor's inadequate capacity to meet its financial commitment on the obligation". Thus, the vast majority of shipping companies issue only high yield bonds.

Table 3-2 displays the characteristics of the 40 shipping high yield bonds by the year of issuance. A total of $6,102 million was raised by these shipping companies in the speculative grade sector during the period 1992-2002, with an average issue float of $152.55 million. The average coupon is 10.36% and the average term to maturity is 9.681 years with no substantial variations in either. The average rating is B+ as assigned by Standard and Poor's, or B1 by Moody's.

Table 3-2: Characteristics of Shipping High Yield Bond Offerings by Year of Issue (1992-2002)
Source: Data collected from offering prospecti and Tradewinds.

Year	Number of Issues	Total Float ($ million)	Average Float ($ million)	Coupon (%)	Term (years)	Rating (S&P/Moody's)
1992	1	125.00	125.00	12.50	12.00	BB-/Ba3
1993	8	1135.0	141.88	9.44	9.625	BB-/Ba3
1994	1	175.00	175.00	11.25	10.00	BB/Ba2
1995	1	175.00	175.00	10.50	10.00	BB/Ba2
1996	3	490.00	163.33	9.61	9.66	BB-/Ba3
1997	6	849.00	141.50	10.17	9.00	B/B2
1998	17	2,728.00	1160.47	10.11	9.53	B+/B1
1999	1	115.00	115.00	10.75	7.00	BB-/Ba3
2000	0	0.00	0.00	0.00	0.00	-
2001	1	260.00	260.00	8.88	10.00	BB-/Ba3
2002	1	200.00	200.00	10.38	10.00	BB+/Ba3
Total	40	6,102	152.55	10.36	9.681	B+/B1

It is clear that most of the issuing activity is concentrated in 1993 (8 issues) and 1997-1998 (23 issues). In 1993, the interest rates were at low levels and, as a result, the bond market as a whole, and thus, high yield bonds were very popular. In addition, in the same period, the issuing activity of shipping equity initial public offerings was also high as noted by Grammenos and Marcoulis (1996); with the main reason being the anticipation of an upturn in tanker freight rates, and the expectation of high growth rates in the East Asia and Pacific areas where some of the companies operated at that time. These reasons seemed to apply in the high yield market as well. For the period between 1997 and 1998, as noted by Grammenos and Arkoulis (2003), the primary reasons for the high issuance level were the debt repayment/restructuring and the replacement of the fleet, because the companies entering the high yield bond market at that period appeared to have very high gearing levels and old fleets.

As part of the analysis we investigated whether the variables used in the model are stationary or not[15]. Recent literature[16] suggests that panel-based unit root tests have higher power than unit root tests based on individual time series. While these tests are commonly termed "panel unit root" tests, they are, theoretically, simply multiple-series unit root tests that have been applied to panel data structures. For the variables used in our model we have computed the following types of panel unit root tests: Levin, Lin and Chu (2002); Breitung (2000); Im, Pesaran and Shin (2003); Fisher-type tests using ADF and PP tests (Maddala and Wu (1999) and Choi (2001)).

We begin by classifying our unit root tests on the basis of whether there are restrictions on the autoregressive process across cross-sections or series. Consider the following AR(1) process for panel data: $y_{it} = \rho_i y_{it-1} + \mathbf{X}_{it}\delta_i + \varepsilon_{it}$, where i=1,2,..,N are cross-section units or series, that are observed over periods t =1,2,...,T_i. The $\mathbf{X}_{it}$ represents the exogenous variables in the model, including any fixed effects or individual trends; ρ_i are the autoregressive coefficients; and finally, the errors ε_{it} are assumed to be mutually independent idiosyncratic disturbance. If $|\rho_i| < 1$, then y_i is said to be weakly stationary; on the other hand, if $|\rho_i| = 1$ then y_i contains a unit root. For purposes of testing, there are two natural assumptions that we can make about the ρ_i. First, one can assume that the persistence parameters are common across cross-sections so that $\rho_i = \rho$ for all i. The Levin, Lin, and Chu (2002) and Breitung (2000) tests employ this assumption. Alternatively, one can allow ρ_i to vary freely across cross-sections; the Im, Pesaran, and Shin (2003), and Fisher-ADF and Fisher-PP tests are of this form.

Table 3-3 displays the results of all four panel-based unit roots tests at levels and first differences respectively. The tests in levels indicate the presence of a unit root for the variables as they cannot reject the null hypothesis of a unit root. The only exceptions to this

[15] Non-stationary data can be misleading and spurious and results obtained from a regression including this kind of data are called spurious regressions (Granger and Newbold, 1974). "A spurious regression usually has very high R^2 and t-statistics that appear to provide significant estimates, but the results have no economic meaning. This is because the OLS estimates are not consistent, and therefore the tests of statistical inference are not valid (Asteriou, 2006)".

[16] Levin, Lin and Chu (2002); Breitung (2000); Im, Pesaran and Shin (2003); Fisher-type tests using ADF and PP tests [Maddala and Wu (1999) and Choi (2001)].

pattern are the Levin, Lin and Chu (2002) and Breitung (2000) tests for the Merrill Lynch single-B index. The tests in first differences reject the null hypothesis of unit root. Therefore, it can be concluded that all the variables contain one unit root and are in fact integrated of order one I(1).

Table 3-3: Panel-Based Unit Root Tests

Method	Laid-Up Tonnage *(LU)*	Consumer Price Index *(CPI)*	Interest Rates *(R)*	Earnings Index *(EARN)*	Merrill Lynch B-Index *(MLBI)*	Market Value *(MV)*
Panel A: Levels						
Levin, Lin & Chu (t-stat)	-0.460 [0.32]	0.086 [0.53]	2.492 [0.00]	-1.120 [0.13]	-4.208 [0.00]	-0.233 [0.40]
Breitung (t-stat)	2.170 [0.98]	5.316 [1.00]	-1.068 [0.14]	2.155 [0.98]	-4.503 [0.00]	-2.084 [0.01]
Im, Perasan & Shin (W-stat)	1.065 [0.85]	8.502 [1.00]	2.144 [0.98]	2.886 [0.00]	-1.341 [0.10]	1.382 [0.91]
ADF-Fisher (chi-square)	55.07 [0.98]	17.90 [1.00]	37.16 [1.00]	54.78 [0.98]	96.64 [0.71]	23.18 [0.72]
PP-Fisher (Chi-square)	50.63 [0.99]	24.43 [1.00]	43.57 [0.99]	35.38 [1.00]	65.88 [0.83]	22.43 [0.76]
Panel B: First Difference						
Levin, Lin & Chu (t-stat)	-37.33 [0.00]	-23.20 [0.00]	-27.94 [0.00]	-7.80 [0.00]	-14.93 [0.00]	-19.30 [0.00]
Breitung (t-stat)	-26.76 [0.00]	-24.04 [0.00]	-25.28 [0.00]	-13.10 [0.00]	-17.91 [0.00]	-17.57 [0.00]
Im, Perasan & Shin (W-stat)	-32.45 [0.00]	-19.49 [0.00]	-22.76 [0.00]	-9.57 [0.00]	-13.17 [0.00]	-17.05 [0.00]
ADF-Fisher (Chi-square)	994.9 [0.00]	578.8 [0.00]	691.4 [0.00]	268.6 [0.00]	484.2 [0.00]	310.8 [0.00]
PP-Fisher (Chi-square)	1060.2 [0.00]	572.1 [0.00]	701.2 [0.00]	298.6 [0.00]	770.3 [0.00]	331.4 [0.00]

- The lag length for the panel-based unit root tests is automatically chosen by using the Schwarz Criterion for lag differences; the Newey-West (1994) method and the Bartlett Kernel were used for the Bandwidth selection.
- Values in [ ] are the probabilities for the tests.

In the remaining of this section we are going to briefly discuss the possible explanatory variables of the dynamics of yield premia of seasoned shipping high yield bonds.

Credit Rating (table 3-4) is meant to be an indication of the likelihood that a company will repay its debt on time, i.e. a measure of credit risk. It is an opinion of future relative creditworthiness and provides objective, consistent and simple measures. As such rating improves the flow of information between lenders (institutional investors / wealthy individuals) and borrowers (issuers). Generally, there is some information asymmetry between the borrowers and the lenders because the borrowers know more about their companies; ratings agencies help reduce this asymmetry of information. Furthermore, the investors' cost of gathering, analysing, and monitoring the financial positions of the

borrowers is also reduced. Accordingly, the overall market efficiency for both borrowers and lenders is improved.

Table 3-4: Standard & Poor's and Moody's Rating Scales
Source: Standard and Poor's Rating Direct and Moody's Investor Service

	Standard & Poor's	Moody's
Investment Grade	AAA+	Aaa1
	AAA	Aaa2
	AAA-	Aaa3
	AA+	Aa1
	AA	Aa2
	AA-	Aa3
	A+	A1
	A	A2
	A-	A3
	BBB+	Baa1
	BBB	Baa2
	BBB-	Baa3
Speculative Grade	BB+	Ba1
	BB	Ba2
	BB-	Ba3
	B+	B1
	B	B2
	B-	B3
	CCC+	Caa1
	CCC	Caa2
	CCC-	Caa3
	CC	Ca
	C	C
	D	-

Moody's assesses the company's ability to repay its debt obligations by focusing on the following main areas: industry trends; national political and regulatory environment; management quality; basic operating and competitive position; financial position and liquidity sources; company structure; parent company support agreements; and special event risk (Moody's Investors Service, 1999). This is a general list of factors that varies according to the industry each company operates. Standard and Poor's views shipping industry's risk profile as speculative grade because of its economic sensitivity, capital intensity, and competitive factors (Lloyd's Shipping Economist, August 2000). Factors such as chartering policy and customer base, fleet efficiency, industry segments, quality of management, debt leverage, and capital structure, are among the major factors which rating agencies focus on when assessing shipping companies' credit quality.

Table 3-5 presents the changes in credit ratings of shipping high yield bonds over the period April 1998 to December 2002 on an annual basis. It can be seen that that the most

prevalent rating in the shipping sector is Ba3 (Moody's) or BB- (Standard and Poor's). The mean rating is even lower at B2 (Moody's) or B (Standard and Poor's). For example, according to the Standard and Poor's rating scale, in 1998 when a large number of issues took place in an uncertain shipping market, as the earnings for shipping companies started to drop, most of the bonds were assigned ratings of BB- and B.

Table 3-5: Bond Ratings in the Shipping Industry
Source: Data collected from Tradewinds

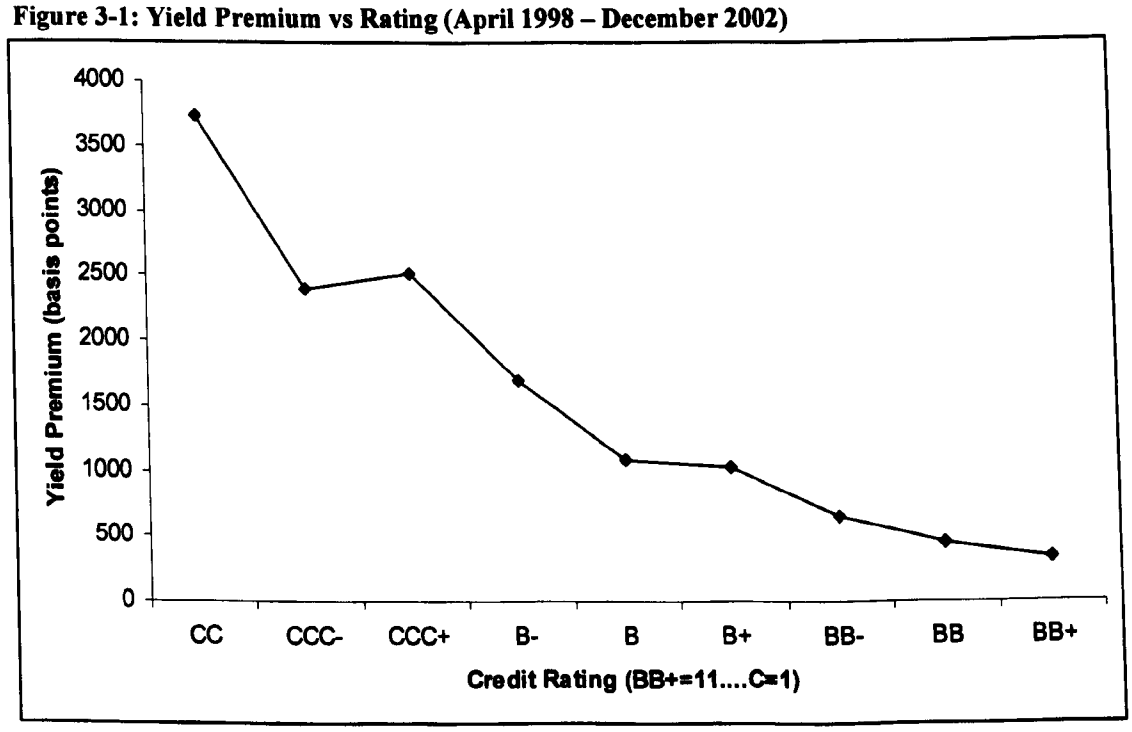
Moody's	Apr. 98	Dec. 98	Dec. 99	Dec. 00	Dec. 01	Dec. 02	S&P	Apr. 98	Dec. 98	Dec. 99	Dec. 00	Dec. 01	Dec. 02
Ba1	0	0	0	0	3	3	**BB+**	2	4	3	1	3	4
Ba2	6	4	3	1	1	1	**BB**	4	3	3	4	2	0
Ba3	10	14	11	12	9	7	**BB-**	15	13	11	6	4	4
B1	7	7	7	4	2	4	**B+**	3	5	3	4	6	5
B2	2	1	0	0	0	0	**B**	6	5	3	1	0	2
B3	5	7	5	0	1	0	**B-**	0	2	4	0	1	1
Caa1	1	2	1	1	0	1	**CCC+**	1	3	1	3	1	0
Caa2	0	0	2	2	2	1	**CCC**	0	0	0	3	2	2
Caa3	0	0	1	4	3	2	**CCC-**	0	0	1	1	1	0
Ca	0	0	3	3	0	2	**CC**	0	0	2	0	1	0
C	0	0	0	1	3	2	**C**	0	0	0	0	0	0
							D	0	0	2	1	3	3
							N/R	0	0	0	4	0	2
Total	31	35	33	28	24	23		31	35	33	28	24	23
Modal Rating	Ba3	Ba3	Ba3	Ba3	Ba3	Ba3		BB-	BB-	BB-	BB-	B+	B+
Mean Rating	B1	B1	B2	B2	B2	B2		B+	B+	B	B	B	B

In 1999, when the shipping market reached bottom levels as in the year 1992, we can observe a downward trend in the credit ratings of shipping companies, and the first defaults. During 2000, although the shipping market had an upward trend the credit ratings for the shipping companies did not improve because they still reflected the previous year's bad shipping conditions and the inability of some shipping companies to meet their debt obligations. As a result, we can see that shipping high yield bond ratings cluster around the BB- and B+ grades as well as the CCC grade. The picture did not change during 2001 and 2002, as the market had a downward trend during 2001 and remained at low levels for most of 2002. Thus, the downgrade of many shipping companies during the period under this analysis can be attributed to the unstable and bad shipping market conditions that prevailed and due to the financial difficulties this caused for the shipping companies.

Grammenos and Arkoulis (2003); Fridson and Garman (1998); and Garman (2000) found credit rating to have the highest correlation with new issue spreads, among other

variables employed in their studies. In our analysis we assign a dummy variable in each rating level of the Standard and Poor's rating scale. We allocate the value of 1 to bonds with the lowest credit quality (C) up to the value of 11 for bonds with the highest credit quality (BB+). A clear pattern emerges between rating and spread from figure 3-1. The average yield premium is plotted against each rating and we observe some evidence of higher rated bonds with lower spreads. Figure 3-1 illustrates that, in one case, the average yield premium level of CCC+ rated companies is higher than those rated CCC-, suggesting that other factors may play a part in the determination of the spread. In general, the lower the rating the higher the yield premium should be, thus we anticipate a negative relationship between spread and rating.

Figure 3-1: Yield Premium vs Rating (April 1998 – December 2002)



We use each individual bond's maturity (remaining months to maturity since issuance) as the measure of the bond's term. A number of studies have included term-to-maturity as a possible explanatory variable in explaining yield premia of new issue high yield bonds. Kim, Ramaswamy, and Sundaresan (1993) present a theoretical model for yield spread as a function of maturity, whereas spreads of callable bonds are smallest for short maturity issues, highest for intermediate maturity issues, and declining for longer maturity issues. Longstaff and Schwartz (1995) identified that spread for bonds with maturity of five to ten years first increases and then declines. Grammenos and Arkoulis (2003) also included term to maturity in their analysis but it was found insignificant.

According to Fons (1994), longer-dated noninvestment grade bonds will generally display a negative spread pattern trend, while investment grade bonds will exhibit a positive spread pattern. He also argued that noninvestment grade companies face a great deal of near-term uncertainty in the ability to meet their obligations but having overcome such obstacles and survived without default, an issue may be upgraded. In other words he suggested that the risk of default is relatively low once a company survives the first few years, and thus, it should carry lower yield premia over the remaining time horizon. Fridson and Garman (1998) included term as a variable in their analysis and hypothesized that their results would support those of Fons (1994). On the other hand, Helwege and Turner (1999) found that speculative grade bonds typically have upward-sloping credit yield curves. Due to the high cyclical and volatile nature of the shipping industry we could not assume that shipping companies become less risky after surviving in the debt market for the first few years. As a result, we will let the results of our model to specify the relationship between the term to maturity and yield premia on shipping high yield bonds.

Prevailing freight rates directly affect the company's profitability. Low earnings mean that the shipping company may not be able to meet its debt obligations[17] and, thus, its default risk increases. According to Zhou (2001) default risk depends on the business cycle. When the economy enters a financial downturn period, bond issuers may face significant problems in generating enough cash flow to pay back interest and principal amounts. Thus, default risk increases and investor's perception of risk also changes, which is reflected by the higher risk premia required. Stopford (2009) links business cycle with freight rates. He suggests that "the business cycle lays the foundation for freight cycles. Fluctuations in the rate of economic growth work through into seaborne trade, creating a cyclical pattern of demand for ships"[18]. Here the ClarkSea Index[19] is employed as an indicator of the direction of

[17] Coupon repayments, other capital costs, operating costs, voyage costs etc.

[18] For instance, the two recessions in sea trade in 1975 and 1982-85 coincided with the recession in the world economy.

[19] ClarkSea Index is a weighted average of earnings for all the main commercial vessel types. The weighting is based on the number of vessels in each fleet sector (oil tankers, dry bulk carriers, gas carriers, and containerships). Clarkson Research collects rates direct from the Clarksons brokers on a daily and weekly basis and these are used to calculate the earnings that go to make up the ClarkSea Index. Operating costs are not included in the construction of the index because the charterer would not normally pay for these. The earnings calculations that make up the index are consistent as commission, operating costs, and waiting time have never been included, and are only intended to be indicators of the direction of earnings and not the earnings on any actual vessel. (Clarkson Research Studies – October 2002).

earnings in the shipping industry and we hypothesize that higher risk premia are associated with lower earnings, reflecting the deteriorating state of the shipping industry and the higher default risk involved.

Laid up tonnage is a variable specific to the shipping industry. As noted by Stopford (2000), "Changes in freight rates may trigger a change in the performance of the fleet, through adjustments to speed and lay-up." When the freight rates are low and the shipping market is in depression then laid-up tonnage is high because market conditions make operation of vessels uneconomical – as the costs[20] for the shipping company are high – and vice versa.

The decision of shipowners to lay-up their vessels does not depend solely on the level of freights rates. If shipowners are able to cover the vessel's operating expenses and part of any debt obligations they have on that vessel, then they may still operate it (provided that the lending institution has accepted this scheme). Thus, they will normally lay-up their vessels when they cannot meet their operating expenses on the specific vessel. Grammenos and Arkoulis (2002) found a negative relationship between laid-up tonnage and shipping stock returns, and they attributed this to the fact that the increased laid-up tonnage is an indicator of a worsening shipping market. Zannetos (1996) has shown that the lower the freight rates, the greater the laid up tonnage (tanker vessels) will be. Laid-up tonnage is incorporated in our analysis as an indicator of the state of the shipping market and we also include a one month lag[21] in order to capture the time delay of freight rate changes to be reflected in the laid up tonnage.

In our analysis, we tested whether the size of the company does play a role in determining the credit spread. For the listed companies, we employed their market value[22] as a proxy of their size. On the other hand, for the unlisted companies, we could not perform any

[20] Oil prices – among other factors – are also related to the costs of a shipping company. They are of particular importance to the shipping industry as they affect the world economic growth and hence the supply and demand for seaborne trade (e.g. oil crises - 1973 and 1979). Fuel represents the most important factor of voyage costs, thus when oil prices rise then costs rise and profitability of the shipping company may shrink. Grammenos and Arkoulis (2002) have found a negative relationship between oil prices and shipping stock returns. However, we did not employ oil prices in our analysis and the reason is that they are already taken into account when calculating earnings in the construction of the ClarkSea Index.

[21] We have tried more than one month lags but we did not get any satisfactory results.

[22] Market value, or in other words, market capitalisation is defined as the company's number of shares outstanding multiplied by the share price.

test on size, as an explanatory variable, due to the lack of data. In order to measure the size of the unlisted companies we needed the total value of their vessels, a set of data which could not be collected for every single unlisted company on a monthly basis. Nevertheless, for the listed companies group, according to Van den End and Tabbat (2005) the default risk of a company increases when its market value decreases which, consequently, implies higher credit spread for its bond(s). Thus, we expect a negative relationship between credit spreads and the market value of a company.

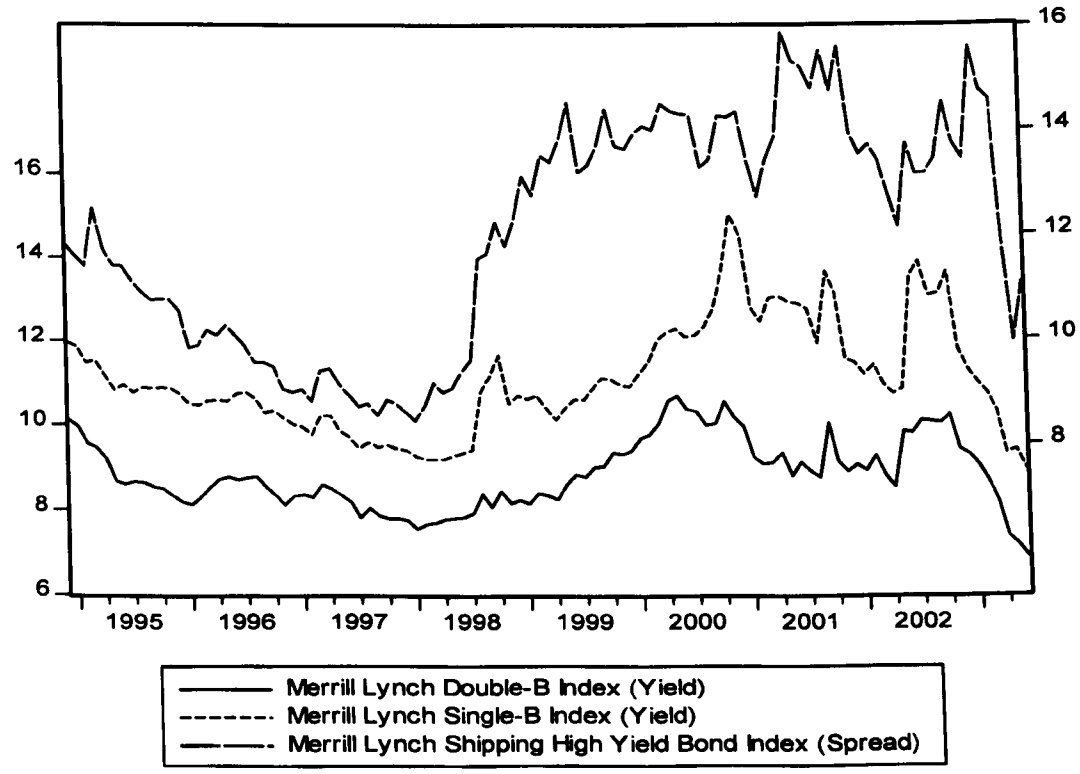
The month-to-month change in the yield of the ten-year Treasuries is used in order to calculate the change in interest rates as a possible explanatory variable. Various studies have employed interest rate changes as a variable in analyzing yield spreads and found a negative correlation between changes in the yield of the ten-year Treasuries and changes in the spread [Fridson and Kenney (1994); Longstaff and Schwartz (1995); Duffee (1998); Fridson and Garman (1998); and Garman (2000)]. The reasoning behind this is that in the short-term the spread between the two asset classes (10 year high yield bond and 10 year Treasury bond) compresses when the Treasury rates rise and expands when these rates fall; therefore yields on corporate bonds do not immediately respond to changes in government bond yields. In the view of these findings a negative relation between the spread of shipping high yield bonds and the monthly yield change in Treasuries is anticipated.

Inflation can affect the world economy, the international trade and, consequently, the profitability of shipping companies. In other words, it is a source of risk. Ferson and Harvey (1994) include inflation in their study and they suggest that higher inflation may signal higher levels of economic uncertainty. Eckhold (1998) and Tarditti (1996) have found a positive relationship between inflationary uncertainty and bond yields. Garman and Fridson (1998) suggested that the net impact of escalating inflation is higher risk premia. In addition, Gruen (1995) found that inflation is a key determinant of nominal bond yields and there is a positive relationship between the two. In line with these findings, a positive relationship between escalating inflation and spreads of shipping high yield bonds is anticipated.

Yield premia of individual bonds may be sensitive not only to changes in the yield of noninvestment grade bond market as a whole, but also to changes in the yield of the particular rating categories to which they belong. The vast majority of shipping high yield bonds is laid

out mainly into two rating tiers, double-B and single-B. As we can see from figure 3-2, the shipping bond index spread and the yield on double-B and single-B corporate indices move rather identically over time. Thus, we hypothesize that the yield on double-B and single-B indices may have a positive explanatory power on shipping high yield bond issues[23].

Figure 3-2: Shipping High Yield Bond Index (Spread) vs Double-B and Single-B Indices (Yield)



3.5) Empirical Results

The results for the panel regression model are shown in table 3-6. For the whole sample, our fixed effects model explains approximately 78 percent of the credit spreads variance. The significant variables are: credit rating, term-to-maturity, changes in the 10-year Treasury Bonds yield, changes in earnings, and the yield on the Merrill Lynch single-B index. Of these, Credit rating, changes in earnings, and the yield on the single-B index all display the expected signs as discussed previously in the text.

On the other hand, changes in the yield on 10-year treasury bonds appear to be significant and have a positive relationship with the yield premia of shipping high yield bonds. As mentioned earlier, in the short-term, yield premia on corporate bonds should not reflect changes on Treasury bonds. In the case of shipping high yield bonds it can be seen that there is a positive relationship with changes in the yield on treasury bonds and it seems that

[23] We do not include Double-B index in our model due to multicollinearity problems.

yield premia reflect those changes in a very short time, as in our model there is one month lag in the variable.

Table 3-6: Fixed Effect Specification Model

$$y_{it} = \beta_{1i} + \mathrm{X}_{kit}\beta_k + \varepsilon_{it}, \quad i = 1,2,\mathrm{K}\ ,N \text{ and } t = 1,2,\mathrm{K}\ ,T$$

	Sample Period: April 1998 – December 2002				
Variables	**All Companies**	**Listed Companies**	**Unlisted Companies**	**Defaulted Companies**	**Non-defaulted Companies**
C	4.243***	6.321***	2.626***	4.038***	4.387***
	(0.239)	(0.406)	(0.346)	(0.772)	(0.258)
RAT_t	-0.285***	-0.448***	-0.352***	-0.187***	-0.158***
	(0.039)	(0.140)	(0.041)	(0.046)	(0.056)
TRM_t	-1.251***	-1.593***	-0.513***	-1.501***	-1.305***
	(0.077)	(0.133)	(0.110)	(0.252)	(0.087)
ΔLUT_{t-1}	0.263	-0.123	-0.031	-0.832	0.432
	(0.317)	(0.438)	(0.402)	(0.665)	(0.360)
ΔCPI_{t-1}	-0.137	3.853	8.238	55.80***	-10.76
	(9.714)	(14.91)	(11.42)	(21.69)	(11.71)
ΔR_{t-1}	0.482***	0.222	0.774***	1.345***	0.251**
	(0.121)	(0.194)	(0.139)	(0.219)	(0.130)
$\Delta EARN_{t-1}$	-2.542***	-3.908***	-1.544**	0.217	-3.108***
	(0.566)	(0.793)	(0.687)	(1.353)	(0.619)
$MLBI_{t-1}$	1.318***	1.357***	1.609***	2.157***	1.095***
	(0.118)	(0.171)	(0.161)	(0.343)	(0.122)
MV_{t-1}	-	-0.279***	-	-	-
		(0.040)			
Total Panel Observations	1,339	526	813	302	1 037
R^2	0.782	0.811	0.767	0.670	0.735
Adjusted – R^2	0.774	0.803	0.758	0.648	0.727
F - statistic	101.1	103.5	80.61	30.23	84.65
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

- Values in ( ) and [ ] are the standard errors and p-values respectively.
- *, **, *** Indicates significance at the 90%, 95%, and 99% level respectively.

It was mentioned earlier that we will let our model to specify the relationship between yield premia and term-to-maturity. Table 3-6 suggests that the spread on shipping high yield bonds increases throughout time; our result is in contrast to Fons (1994) when he argued that the more a speculative company has been in the debt market the lower the yield premium should carry, but in line with the study of Helwege and Turner (1999). Thus, shipping companies illustrate higher yield premia throughout time and we attribute this phenomenon to the highly cyclical nature of the shipping industry. For instance, the bad shipping market conditions of 1998/99 led a number of shipping issues to default, and as a result, higher spreads might also be the outcome of a slow process of regaining the confidence of investors and credit rating agencies.

Another interesting result is the statistical significance of earnings. In our study we added earnings (alongside laid-up tonnage which was used as a variable in the study of Grammenos and Arkoulis (2003)) because we feel the shipping market is represented more accurately at any point of time, since the fluctuation in earnings manifest the volatility of the shipping market. It should be mentioned that in our model, the credit rating's statistical significance is dominant. Nevertheless, although investors take seriously into account credit ratings, the shipping market (which is represented by earnings) does play a role in determining the spread. That might be due to the following reasons: credit ratings are not normally adjusted immediately to reflect market changes and investors do look at the shipping market closely even though it is incorporated in the credit rating; or it shows the importance that investors base on the cash flow stability of the company and thus why they feel the need to monitor the shipping market constantly regardless its incorporation in credit ratings. As a result, investors assess the shipping market as well as taking into account the credit ratings when they decide to invest in shipping high yield bonds. At this point is should also be noted the difference between our paper and the paper of Grammenos and Arkoulis (2003) regarding credit rating. As we mentioned above in our case the credit rating adjusts in order to reflect the quality of the issue (even though that might take a substantial amount of time since the fundamental change in the issue's quality and the overall shipping market) whereas in the study of Grammenos and Arkoulis (2003) the credit rating is taken as given by investors at the time of issuance; in other words in our analysis we have a dynamic environment, whereas in the Grammenos and Arkoulis (2003) analysis it was static .

In short, our model suggests that shipping high yield bond's spread has a negative relationship with regard to credit rating, term-to-maturity, and earnings of the shipping market. On the other hand, it is positive related to the yield on the ten-year Treasuries and the Merrill Lynch single-B Index.

In comparison to the Grammenos and Arkoulis (2003) study, we can see that our results are in line with their findings as far as credit rating, and earnings (laid-up tonnage in their study, but both reflecting the status of the shipping market) are concerned. Both these factors appear to have statistical significance in explaining the dynamics of yield premia after issuing and throughout the time.

In order to investigate the magnitude and signs of the significant explanatory variables of our model, we categorised the whole sample into listed, unlisted, defaulted, and non-defaulted companies. In that way, we can also investigate whether the market value, as a variable, plays any significant role in explaining the dynamics of yield premia for bond issues offered by publicly listed companies.

The sample for the listed companies contains fourteen issues offered by seven companies and the model includes the same variables as before, with the addition of the market value for each company as a possible explanatory variable. Results from this estimation procedure are reported in table 3-6. The significant variables are the same as in the whole sample, with the exception of changes in the yield on the ten-year Treasuries and, with the addition of market value. All coefficients are significant at a confidence interval of 99 percent and display the expected signs. The addition of market value as a significant explanatory variable may signal that larger companies – in terms of market capitalisation – are considered to be less risky by the investors and thus, they carry lower credit spreads on their high yield bond issues.

The same fixed effects model was run (with the exclusion of market value variable) for the unlisted, defaulted and non-defaulted, companies; results can be found in table 3-6. The significant variables show the expected signs in all cases, and the prevailing factors in all three categories are: credit rating, term-to-maturity, changes in the 10-year Treasury bonds, changes in earnings, and the yield on the Merrill Lynch single-B index.

3.6) Conclusions

In this paper we have investigated factors that may explain the dynamics of yield premia on seasoned shipping high yield bonds. Our results suggest that shipping high yield bonds' yield premia will be larger – all other things being equal – the lower the credit rating and the lower the earnings in the shipping market; moreover, the yield premia will also be wider throughout the passage of time until maturity and thus, we have found a negative relationship with term-to-maturity. Finally, changes in the yield of 10-year Tresury bonds and the yield on the Merrill Lynch single-B index appear to positively affect the yield premia on seasoned shipping high yield bonds. Our model appears to be valid even when we categorised

the whole sample into listed, unlisted, defaulted and non-defaulted, companies; whereas for the listed companies, their size – as measured by their market capitalisation – does play a significant role in explaining the yield premia of their seasoned high yield bond issues.

Our results have implications for active management strategies; in particular, bond portfolio managers who allocate their holdings by industries/sectors and need to know which factors affect the dynamics of yield premia in the different industries/sectors. In addition, our results may have implications for shipping companies in the following ways: shipping companies are interested in yield premia as they have an impact on the company's image and thus, its future financing decision for further issuance of high yield bonds - they are an indication of possible cost level in order to enter the shipping high yield bond market – or their possible stepping to the equity capital market.

Chapter 4. Estimating the Probability of Default for Shipping High Yield Bond Issues

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4.1) Introduction

There can be little doubt that an increasing number of shipping companies are regarding the capital markets as an integral part of their comprehensive strategy for optimizing financial management through a combination of traditional bank lending, private placements and public issues of debt and equity. Additionally, it has been noticed that operational flexibility and efficiency are achieved: by increasing the size of shipping companies through purchasing secondhand, or ordering, new vessels; by mergers and acquisitions; by the formation of shipping pools. The first and second methods may imply an increased need for capital by the shipping industry – which is also intensified by the replacement requirement of older vessels.

One method for raising capital – as mentioned above – is by tapping the high yield bond market. The first high yield bond offered by a shipping company took place in 1992 when Sea Containers Ltd. issued $125 million of subordinated debentures; since then, more than 60 issues have taken place and raised more than $10 billion. Shipping is an industry characterized as being highly cyclical, volatile, capital intensive and often highly geared. This might constitute a problem for companies when they have to make interest and capital repayments in a recessed shipping market as they may not have sufficient cash flows to meet their obligations. This problem may also be enhanced when the shipping companies operate their fleet in the spot market rather than in the time-charter market[1]. For instance, a number of shipping companies – operating their fleet mainly in the spot market - entered the US high yield bond market in 1997/8 and found themselves unable to meet their debt obligations after the 1999 recession in the shipping market.

[1] The freight market – which is the marketplace in which sea transport is bought and sold – has two different types of transactions, the freight contract (spot) in which the shipper buys transport from the shipowner at a fixed price per ton of cargo and the time-charter under which the ship is hired by the day for a period of time (Stopford, 2009).

However, more recently we have seen an increased interest of shipping companies in the high yield bond market; during 2003-2005, sixteen new high yield bond issues were offered by shipping companies[2]. This, coupled with the capital intensity feature of the shipping industry and the high number of defaults which mainly occurred in 1999, was the main motivation for the creation of this paper. In addition, the importance of industry classification is another significant factor. Fridson and Garman, (1998) argued that when studying the pricing of new high yield bonds, it would be better to categorise the bonds by industry in order to avoid biased results; a useful argument as a number of bond portfolio managers allocate their holdings by industries/sectors. As a result, we hypothesize that shipping high yield bonds should be studied as an industry due to its cyclical, volatile and capital intensity characteristics.

Prior research has produced a number of models in predicting financial distress in corporations. Most of the previous studies predict financial distress by using financial data for a number of months or years prior to the default event and only one uses financial data at the time of issuance[3]; when the decision by the high yield bond investor to buy, or not, the financial instrument, is made[4]. This paper utilises the method of the Huffman and Ward (1996) study, and contributes to the existing ship finance literature in the following ways: firstly, and for the first time in the ship finance literature, the probability of default – at the time of issuance[5] – for high yield bonds offered by shipping companies is predicted by employing a binary logit model; investors may benefit from this research since, by employing easily accessible and quantifiable factors, they can identify at the time of issuance a) which factors to look at in making investment decisions, and b) issues that might have a high likelihood to default; at the same time, shipowners who offer high yield bonds can also identify which factors are important in predicting the probability of default for their issues.

[2] Source: Bloomberg.
[3] Huffman and Ward (1996).
[4] Although there is a secondary market for high yield bonds, this is very thin, and that is why the bid/ask prices differ between different sources; consequently, predicting the likelihood of default at the time of issuance is of importance to investors.
[5] The reason we focused on the time of issuance is because the financial data for a number of shipping companies were not available prior to default; that was due to the fact that many of shipping high yield bond issues defaulted approximately a year or a year and a half after their issuance.

Secondly, this is attempted by not only using financial ratios employed in previous models, but with the addition of two industry specific variables and another financial ratio, not used previously. Finally, by employing a bootstrap technique, we run in-and-out-of-sample tests in order to validate the robustness of our model.

The chapter is organised in the following manner: in the next section 4.2, the literature review and methodology is provided; in section 4.3, the data and variable definitions are discussed; in section 4.4, the results of the analysis, the predictive ability of the model, and the out-of-sample tests are reported; finally, section 4.5 concludes the chapter.

4.2) Literature Review and Methodology

Bankruptcy and default on a debt instrument represent different phases of financial distress, and the literature on bankruptcy models can be explored in the search for a methodology to predict the likelihood of default for high yield bonds. Bankruptcy occurs when a company is declared insolvent and the assets are liquefied in order to repay its creditors. On the other hand, default is defined as the failure of the company to make timely payments of interest or principal to bondholders; furthermore, default occurs prior to bankruptcy and the former may not lead to the latter. In the case of default, issuers and investors, with the help of financial institutions have to formulate a restructuring mechanism[6].

Studies on predicting financial distress can be categorised into those using financial ratios and into those using cash flow measures in their analysis. Since the ground breaking research of Beaver (1966) and Altman (1968), numerous studies have concentrated on the prediction of financial distress. Beaver (1966) identified 30 financial ratios that were expected to capture the probability of failure. By using a univariate discriminant analysis, the ratios with the best predictive ability were the working capital over total assets and the net income over total assets which correctly identified 90 percent and 88 percent of bankrupt and non-bankrupt firms in his sample respectively. Altman's (1968) study was the first one to use

[6] Normally, restructuring mechanisms include: traditional Chapter 11 bankruptcy, pre-packaged bankruptcy, and out-of-court restructuring; for a detailed analysis on the choice among the different restructuring methods see Yost (2002).

multivariate discriminant analysis in order to explain the interaction of financial ratios in predicting bankruptcy. His final model was made up of 5 financial ratios: working capital over total assets; retained earnings over total assets; earnings before interest and taxes over total assets; market value of equity over book value of debt; and sales over total assets. Ohlson's (1980) study used a logit model and tested whether various financial ratios and other factors were associated with bankruptcy. His study was concerned not only with the predictive ability of the model, but also the model's coefficient estimates. Overall, 4 variables were included in his model: total assets over GNP price-level index; total liabilities over total assets; some performance measure or combination of performance measures (net income over total assets and/or funds provided by operations over total liabilities); and some measure of current liquidity (working capital over total assets or working capital over total assets, and current assets over current liabilities jointly). Other studies that used the logit analysis approach include, Santomero and Vinso (1977), Martin (1977), and, Estrella et al. (1999), where they tried to estimate the probability of failure for banks and the banking system. Studies using accounting ratios to predict bankruptcy for corporate companies include Collins (1980), who also made a comparison between discriminant analysis and linear probability models, Platt and Platt (1990), Bernhardsen (2001) who used logit analysis, and Saretto (2004) who applied a simple piece-wise constant hazard model to study how corporate bond defaults can be predicted using financial ratios and how the forecasted probability of default relates to the cross-section of expected stock returns. Finally, by employing the logit model, Dewaelheyns and Van Hulle (2006) show that the company's size, current performance, leverage, liquidity, and the group/industry to which it belongs, have a significant impact on the probability of failure.

Nearly two decades after Altman's (1968) study, a new approach based on cash flows emerged. Gentry et al. (1985a, 1985b) were among the first to employ such an approach by using logit analysis; whereas Casey and Bartczak (1984) by using multiple discriminant analysis (MDA) and logit analysis concluded that cash flow data was a poor predictor of financial distress. On the other hand, Gombola et al. (1987) found that cash flow ratios were

useful in explaining future business bankruptcies and their study was followed by Aziz, Emanuel, and Lawson (1989), who identified the usefulness of financial ratios in predicting bankruptcy. Flagg and Giroux (1991) examined whether bankrupt and non-bankrupt firms could be correctly classified when the sample consisted of only failing firms; their results suggested a successful model where two failure events and four financial ratios were combined. In addition, Shumway (2001) proposed a simple hazard model - for forecasting bankruptcy - that uses both accounting ratios and market driven variables. Finally, Charitou et al. (2004) employed both logit and neural networks models for predicting failure for UK industrial companies. Their results suggested that a cash flow, a profitability and a financial leverage variable, yielded an overall correct classification accuracy of 83 percent one year prior to the failure – with both models showing no superiority between each other in their predictive ability.

In the literature on high yield bond defaults, the work of Altman and Nammacher (1985) focused on the incidence of default in the high yield bond market. They concluded that the average annual default rate is in the 1 to 3 percent range, whereas the average spread of yields between quality and high yield bonds fluctuates within 3 to 5 percent, which more than offsets the default risk implicit in high yield bonds. In another study, Altman (1989) used a mortality rate concept to measure default rates conditional on the age of the bond. He found that cumulative bond mortality increases with the age of the bond and can reach as much as 32 percent for single-B rated bonds over a ten-year period. Similarly, Asquith et al. (1989) found that the longer a high yield bond is outstanding, the greater the likelihood of default. In addition, Rosengren (1993) provided evidence that rated and non-rated convertible high yield bonds have significantly lower default rates. Hakim and Shinko (1995) showed that a reduction in equity value increased variation in long-term debt levels, and that reductions in cash flows are found to be statistically significant indicators of higher default probabilities for high yield bonds. Finally, Huffman and Ward (1996) have established a logit model for the prediction of default for high yield bonds at the time of issuance, using variables that were employed in previous studies.

Following Altman's (1968) seminal study, a number of studies applied the Linear Discriminant Analysis (LDA) and Multivariate Discriminant Analysis (MDA) approaches to develop a Z-score bankruptcy model for different markets [for example Taffler (1984) and Grice and Ingram (2001)]. According to Altman and Narayanan (1997), the most popular techniques worldwide are still the multivariate discriminant analysis (MDA) and logistic regression. However, one criticism of MDA is that it assumes multivariate normality and equal covariance matrices for both healthy and failed companies - two assumptions that do not always reflect the real world and especially the case of financial ratios data[7]. On the other hand, the logistic regression has the added advantage that it does not assume multivariate normality and equal covariance matrices as MDA does[8]. For instance, the Laitinen and Kankaanpaa (1999) study discussed six alternative methods to the MDA and logit models, which have been applied in the search for failure prediction models, and concluded that no superior method – compared to the MDA and logit models – was found with the variables they employed. In addition, Boritz et al. (1995) made a comparison between MDA, logit, probit and neural networks analyses and found no superior method. Furthermore, Charitou et al. (2004) compared the performances of neural networks and logit models and found that both are reliable alternatives for company failure prediction. Balcaen and Ooghe (2004) study gives a clear overview and discussion of the alternative modelling methods compared to the classical discriminant analysis and logit models. The study, based on an extensive analysis of a large number of empirical studies, concludes that "although the alternative methods are computationally more complex and more sophisticated than the classical cross-sectional statistical methods, it is not clear whether they produce better performing corporate failure prediction models".

Taking into account the findings of the above studies; the study of Barniv et al. (2002) where it is stated that logit analysis has been the most commonly used technique in the recent literature; and the fact that the goal of this study is to propose - for the first time in the

[7] Deakin (1976).

[8] McFadden (1984) and Lo (1987) have identified several statistical reasons for preferring logit analysis to linear and multivariate discriminant analysis.

shipping finance literature - a model predicting the probability of default for shipping high yield bonds, and not to built a model through technical improvements in order to compare it with previous ones (as there is no previous model for shipping high yield bonds default), we concluded that a standard binary classification technique, here the logit analysis, would be the most appropriate one.

The logit technique creates a score for each firm by weighting the independent variables. We assumed that the variable $y_i \in \{0,1\}$ is related to an index y_i^* by a linear function of the explanatory variables $x_{i1}, x_{i2}, ..., x_{ik}$ and the random term u_i such that:

$$y_i^* = x_i'\beta + u_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + ,.... + \beta_k x_{ik} + u_i$$

$y_i^* = 1$ if the company has defaulted

$y_i^* = 0$ if the company has not defaulted

By this structure we have;

$$\Pr\left(y_i = 1 \middle| x_i'\beta\right) = \Pr\left(y_i^* > 0\right) = \Pr\left(x_i'\beta + u_i\right) = F_u\left(-x_i'\beta\right)$$

where $F_u(\ )$ is the cumulative distribution function of u. We assume that u is logistically distributed and thus:

$$\Pr\left(y_i = 1 \middle| x_i'\beta\right) = F_u\left(-x_i'\beta\right) = \frac{1}{1+\exp\left(x_i'\beta\right)} = \frac{1}{1+\exp\left[-\left(\beta_0 + \beta_1 x_{i1} + ... + \beta_k x_{ik}\right)\right]}$$

where X_i $(i=1,..,k)$ are the independent variables, and β_0 and β_i $(i=1,..,k)$ are the estimated parameters.

4.3) Description of Data and their Properties

The data sample consists of 50 shipping high yield bonds issued in the period 1992 - 2004. Of these bonds, 13 had defaulted by the end of 2004, and the remaining 37 bonds were still trading assets or had expired. The financial[9] and specific data for the companies were collected from the offering prospecti, whereas the industry specific variable for the shipping market was constructed using data collected from Clarksons' Shipping Intelligence Network.

A number of variables were employed and tested in our analysis in order to best predict the probability of default of shipping high yield bonds at the time of issuance. These variables can be categorized into three groups: issue specific; financial specific; and industry specific.

4.3.1) Issue Specific Variables

The ***coupon (CP)*** is the amount the bondholder will receive as interest payments. Higher coupons mean higher interest payments to investors and, thus, we expect higher coupons to be associated with higher probabilities of default.

We use each individual bond's ***maturity (MAT)*** (remaining months to maturity since issuance) as the measure of the bond's term. Non-investment companies that issue new high yield bonds face a great deal of near-term uncertainty in the ability to meet their debt obligations; having overcome such obstacles and survived without default of their issues , then the risk of default may be reduced. Nevertheless, due to the highly cyclical nature of the shipping industry, we cannot assume that shipping companies become less risky after surviving in the debt market for the first few years. As a result, we will let the findings of our model specify the relationship between the term to maturity and default probability of shipping high yield bonds.

Credit Ratings (RAT) are meant to be an indication of the likelihood that a company will repay its debt on time. As such, ratings improve the flow of information between

[9] The financial data were extracted from the latest end-of-year income statements and balance sheets for the company at the time of the issue.

institutional lenders (investors) and borrowers (issuers) and they reduce the investor's costs of gathering, analyzing, and monitoring the financial positions of the borrowers. In our analysis we assign an integer variable for each of the Standard and Poor's rating scale. We allocate the value of 1 to high yield bonds with the lowest credit quality (C) up to 11 for bonds with the highest credit quality (BB+). We expect a bond issue with low credit rating to be more likely to default.

4.3.2) Financial Specific Variables

In assessing the significance of various financial data, managers engage in ratio analysis, i.e. the process of determining and evaluating financial ratios. The ***working capital[10] over total assets ratio (WC/TA)*** is a measure of the net liquid assets of the firm relative to the total assets. Normally, a firm with negative working capital is likely to experience problems meeting its short-term obligations because there are simply not enough current assets to cover them. As a result we would expect a higher probability of default to be related to lower values of this ratio.

Current assets and liabilities are also an important part of the company's liquidity and, thus, we also employed the ***current ratio (current assets/current liabilities – CA/CL).*** When this ratio is below 1, the firm does not have enough current assets to meet its current liabilities and is, therefore, technically insolvent. In our analysis we expect a negative relationship between these two ratios and the probability of default.

Cash over Freight Revenue (CASH/FR) is another liquidity ratio showing the company's most liquid assets in relation to its freight revenue (sales – in the P&L Account). A low value of this ratio would mean that the company is not keeping enough cash in relation to its freight revenue and this might constitute a problem in meeting future debt obligations. The ***Freight Revenue over Current Liabilities (FR/CL)*** measures the freight revenue generated by the company against current liabilities and is, therefore, seen as a conservative liquidity ratio. The formula is an indicator of the extent to which a company can pay current

[10] Working capital is defined as the difference between current assets and current liabilities.

liabilities without relying on the sale of its assets (vessels in the case of shipping companies) and without relying on the receipt of accounts receivables. A negative relationship is anticipated between these ratios and the likelihood of default.

The ***Net Income over Freight Revenue (NI/FR)***, or in other words the profit margin, is a measure of profitability. Profit margin is an indicator of a company's pricing policies and its ability to control costs and it can vary by industry but, all else being equal, the higher a company's profit margin compared to its competitors, the better. Another ratio similar to the profit margin is the ***Earnings before Interest, Taxes, Depreciation and Amortisation over Freight Revenue (EBITDA/FR)*** ratio which uses the profits before interest, taxes, depreciation and amortisation, rather than the net profits. Thus, the expected sign for these two ratios is negative.

The ***Net Income over Total Assets (NI/TA)***, the so called return on assets (ROA) ratio, is a measure of the company's asset intensity. Companies such as telecommunication providers, car manufacturers, railroads, and shipping are very asset-intensive, requiring large and expensive machinery, equipment or vessels, to operate and generate a profit. One of the most important profitability metrics is the ***Net Income over Shareholder's Equity ratio (return on equity - ROE)***. Generally, it reveals how much profit a company generates with the money its shareholders have invested. It is useful for comparing the profitability of a company to that of other firms in the same industry. The higher a company's return on equity and return on assets compared to its industry, the better. Consequently, the probability of default is expected to be negatively related with these ratios.

A measure of cumulative profitability over time is given by the ***retained earnings over total assets ratio (RE/TA)***. Companies with a high retained earnings/total assets ratio suggest a history of profitability and the ability to stand up to a bad year of losses; thus, we expect a negative sign for this ratio.

The ***Freight Revenue over Total Assets Ratio (Total Assets Turnover Ratio - FR/TA)*** is meant to measure a company's efficiency in using its assets. The higher a company's asset turnover, the lower its profit margin tends to be, and vice versa. Similarly to

the total assets turnover, the ***Freight Revenue over Fixed Assets ratio (Fixed Assets Turnover -FR/FA)*** compares the total freight revenue with the fixed assets which the company has used to generate that freight revenue. The ratio measures the efficiency of capital investment and the higher it is, the better. Both ratios are expected to have a negative relationship with the probability of default.

The ***Net Income over Interest Expenses ratio (Interest Coverage Ratio - NI/IE)*** is a measurement of the number of times a company could meet its interest payments by using only its earnings; the lower the ratio, the higher the company's debt burden. Thus, we should expect that lower interest cover ratios are associated with a higher probability of default.

The ***Long Term Debt over Long Term Debt Plus Shareholder's Equity Ratio (Gearing Ratio - GEAR[11])*** shows at a glance how encumbered a company is with debt and is a measure of the company's ability to survive in income recession periods. A rising gearing will indicate an increasing reliance upon bank money or other forms of debt for vessel acquisitions, and this may create problems with paying interest and repaying capital if the market conditions deteriorate. Shipping companies with a high gearing ratio and problematic income generation, faced survival problems in the early 1980s, while others defaulted in their high yield debt obligations in 1998/9. However, during high income periods such as in the late 1980s and in 2003/4, highly geared companies substantially increased their revenues and expanded. Naturally, companies operating in the long term time-charter market may have no difficulties in paying out interest to the bondholders, while companies operating in the spot or in the short term time-charter markets may face severe difficulties in paying them interest, as happened in 1998/9. Grammenos and Arkoulis (2003) studied the initial pricing of shipping high yield bonds and emphasised the importance of gearing for high yield bonds offered by shipping companies. Thus, highly geared companies carry higher risk and, as a result, we should expect a positive relationship between the gearing ratio and the probability to default.

[11] This ratio does not take into account the amount to be raised by the high yield bond issue offered by shipping companies, thus, it is a pre-issue gearing ratio.

The ***amount raised over total assets (AR/TA) ratio*** is also used and shows how big the issue is in relation to the size of the company. Rational investors should be cautious with companies entering the high yield bond market to raise large amounts in relation to their size. In our analysis, we hypothesize that a large value of this ratio is related to higher probabilities of default.

4.3.3) Industry Specific Variables

In order to capture the state of the shipping market at the time of each high yield bond issue we constructed the following industry specific variable.

By using the time-charter rates[12] for each sector of the shipping market (tanker, dry bulk, gas, chemical, offshore and liner) we constructed normalised indices in order to capture the shipping market conditions prevailing at the time of the issue[13]. The base period year for the indices was set to January 1987, in order to enables us to calculate 3 and 5 year moving averages prior to the first issue of a shipping high yield bond. The reason for constructing indices for each sector is that shipping companies entering the high yield bond market are divided into Tanker, Dry Bulk, Gas, Chemical, Offshore, Liner or a combination of these[14]; in this way, we have indices that are representative of the market conditions in the sectors in which each company is operating. In our analysis, we compare the returns of the indices at the time of issuance with the last 3-year moving average, in order to evaluate the state of the shipping market at the time of issuance relative to the previous years market conditions. If the returns are above the 3-year moving average then the market conditions have improved compared to the immediate past; as a result, the shipping market is favourable when the issue

[12] With the exception of the Chemical Tankers Sector, where we used the spot rates – as such data as time-charter rates do not exist for the sector.

[13] The indices are weighted according to the deadweight of each segment in the sector relative to the total deadweight of the sector. For example, in the tanker sector we construct normalised indices for each segment (VLCC, Suezmax, Aframax, Panamax, Handysize) by using time-charter rates; then, in order to construct the overall tanker index, we calculate the monthly rebalancing weights for each segment according to their deadweight in relation to the total deadweight of the tanker sector.

[14] In the case where we have a diversified company, for reasons of simplicity and due to the fact that it was difficult to find the exact types of vessels each company operated at the time of issuance, we gave equal weights to the indices. For example, if a company was operating in the tanker and dry bulk sectors, then the shipping index for this company is constructed by equally weighting the Tanker and Dry Bulk indices respectively.

takes place[15]. Consequently, we expect a negative relationship between this variable *(SHIP)* and the likelihood of default.

4.4) Empirical Results

Descriptive statistics for the variables employed in our analysis are presented in table 4-1, panel A and B respectively; panel A also presents the t-statistics of testing the null hypothesis that the mean values of the variables for both defaulted and non-defaulted issues are the same. This test provides a rough indication of the possible explanatory variables for our model. The variables that have significantly different means include all the liquidity ratios, the coupon, the credit rating of the issue, the gearing of the company, the amount raised-over-total assets ratio and, finally, the shipping variable, *SHIP*. More specifically, at the time of issuance, the issuers of defaulted shipping high yield bonds compared to those that did not default, are characterised as having: lower credit rating, lower working capital over total assets; lower retained earnings over total assets; lower current ratio; lower cash over current liabilities; and a lower value of *SHIP*. On the other hand they have higher coupons, higher gearing level, and a higher ratio of amount raised over total assets.

The results reported in table 4-1 – panel B show that most of the new shipping high yield bonds were assigned a credit rating of double-B, with fewer a credit rating of single-B. Moreover, 8.82 percent of the double-B rated bonds (BB+, BB, and BB- ratings) in the sample defaulted, compared to 53.30 percent of single-B rated bonds (B+, B, and B- ratings). Thus, choosing only the higher rated bonds in a shipping high yield bond portfolio may ensure that the probability of default is reduced[16].

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[15] In our analysis we also tried the 5 year moving average; this did not affect the results presented in the paper.

[16] In our analysis, we also grouped credit rating in three categories, namely, BB, B, and CCC+. The reason for doing such an analysis was to check whether there was any difference in our final results by the treating credit rating scale as non-linear; nevertheless, no difference was detected. After all, credit rating agencies have the signs of (+) and (-) in order to better capture the different quality of each issue Moreover, previous literature has treated credit ratings in the same manner [Fridson and Garman (1998), Laitinen (1999)].

Table 4-1: Descriptive Statistics for Shipping High Yield Bonds (Panel A)

	All Issues (50)		Defaulted Issues (13)		Non-Defaulted Issues (37)		
Variable	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	t-Statistic[a]
Issue Specific							
Amount Raised - *(AR) ($Million)*	152,000,000	86,448,079	142,338,462	55,196,521	155,022,075	95,464,183	0.578
Coupon - *(CP) (%)*	0.10001	0.01507	0.10712	0.01136	0.09750	0.01554	-2.370*
Maturity - *(MAT) (Months)*	114.76	25.8374	104.307	23.1782	118.432	26.0048	1.829
Rating - *(RAT) (C=1,...BB+=11)*	8.680	1.26877	7.53846	1.33012	9.08108	0.98258	3.830*
Liquidity Ratios							
Working Capital / Total Assets *(WC/TA)*	0.00665	0.12746	-0.09019	0.10757	0.04069	0.11697	3.687*
Current Ratio - *(CA/CL)*	1.51566	2.03115	0.62857	0.55739	1.82735	2.26446	2.973*
Cash / Freight Revenue - *(CASH/FR)*	0.16751	0.22692	0.09182	0.09299	0.19411	0.25379	2.010*
Cash Ratio - *(CASH/CL)*	0.62727	0.89866	0.21408	0.21176	0.77245	1.00049	3.197*
Profitability Ratios							
Profit Margin - *(NI/FR)*	0.08496	0.11685	0.10669	0.18300	0.07733	0.08481	-0.557
EBITDA / Freight Revenue - *(EBITDA/FR)*	0.34176	0.17060	0.37542	0.20207	0.32994	0.15954	-0.734
Return on Assets - *(NI/TA)*	0.03377	0.04550	0.04048	0.06953	0.03142	0.03443	-0.451
Return on Equity - *(NI/SE)*	0.03374	0.43622	0.14405	0.33327	-0.00501	0.46481	-1.242
Retained Earnings / Total Assets *(RE/TA)*	0.21134	0.29535	0.07150	0.10686	0.26048	0.32463	3.095*
Activity Ratios							
Total Assets Turnover - *(FR/TA)*	0.45626	0.27612	0.43297	0.29923	0.46445	0.27142	0.334
Fixed Assets Turnover - *(FR/FA)*	0.57399	0.40614	0.51022	0.42174	0.59640	0.40403	0.640
Debt Ratios							
Interest Cover - *(NI/IE)*	1.81067	3.12454	1.87508	3.59731	1.78805	2.99544	-0.078
Gearing - *(GEAR)*	0.570080	0.970096	0.70236	0.13159	0.53201	0.21037	-3.388*
Other Ratios							
Amount Raised / Total Assets *(ARTA)*	0.54870	0.62898	1.30228	0.62931	0.28396	0.35972	-3.505*
Returns of Shipping Index *(SHIP)*	0.089551	0.326821	-0.04168	0.02267	0.13566	0.36988	2.900*

Table 4-1 - Panel B: Descriptive Statistics for Shipping High Yield Bonds Ratings

	All Issues (50)	Defaulted Issues (12)		Non-Defaulted Issues (38)	
	Number	Number	% of Group	Number	% of Group
BB+	**4**	**0**	**0%**	**4**	**100%**
BB	**5**	**1**	**20%**	**4**	**80%**
BB-	**25**	**2**	**8%**	**23**	**92%**
Total BBs	34	3	8.82%	31	91.18%
B+	**6**	**3**	**50.00%**	**3**	**50.00%**
B	**8**	**5**	**62.50%**	**3**	**37.50%**
B-	**1**	**1**	**100%**	**0**	**0%**
Total Bs	15	9	53.30%	6	46.70%
CCC+	**1**	**1**	**100%**	**0**	**0%**
All Issues in Sample	**50**	**13**	**24%**	**37**	**76%**

(a) t-statistic testing the mean difference between defaulted and non-defaulted issues; *indicates means are significantly different at the 5% level.

In search of the best model to predict the probability of default for shipping high yield bond issues we used the stepwise method, which was also used in the studies of Charitou et al. (2004), Barniv et al. (2002), and Back et al., (1996)[17]. This involves the following steps. Firstly, we identified the possible explanatory variables by running univariate logistic regressions, consisting of an intercept term and one possible explanatory variable. It should be stressed that statistically significant variables in the univariate model may not necessarily enter in the multivariate model. Next, we altered the model by adding or removing a variable in accordance to its p-value and the likelihood ratio test – making always sure that we did not enter variables that are highly correlated with the already existing variables in the model. Each selection step was followed by one or more entry/elimination steps, with variables already selected into the model not necessarily staying if proved insignificant. The selection process was terminated if no further variable could be added to the model, or if the variable lastly entered was the only one removed in the subsequent elimination step.

One possible problem from the use of correlated variables is multicollinearity, which may result in biased results. Following the suggestion of Lewis-Beck (1980) – that correlation coefficients between the explanatory variables which are greater than 0.8 may indicate the presence of multicollinearity – we examined the bivariate correlations among the independent variables and in all cases correlation coefficients were less than 0.8. In addition, we also employed the tolerance statistic (Lewis-Beck, 1980) in order to check for multicollinearity between the independent variables included in the model. The tolerance statistic is defined as the percentage variance of each independent variable that is not explained by all the other independent variables in the model. For the independent variable X_i the tolerance statistic equals $1 - R^2_{X_i}$, where $R^2_{X_i}$ is the R^2 of a linear regression using variable X_i as the dependent variable and all the remaining variables as independent variables. If the value of the statistic for a given independent variable is close to 0, that indicates that the information the variable provides can be expressed as a linear combination of the other independent variables. As a

[17] It should be mentioned that one limitation of the studies in predicting corporate default is the lack of a sound theoretical framework to guide the selection of the best potential explanatory variables [Huffman and Ward (1996), and Charitou et al. (2004)].

rule of thumb, only tolerance statistics lower than 0.2 are cause for concern. The tolerance statistics for each independent variable included in our model can be found in table 4-2.

The results from the final estimated model are presented in table 4-2. Our final model includes a set of financial ratios and a market specific ratio; these are: the working capital over total assets ratio, the retained earnings over total assets ratio, the gearing ratio, the amount raised over total assets, and the index SHIP.

Table 4-2: Logit Model for Predicting the Probability of Default for Shipping High Yield Bond Issues

$$F(-\beta' x_i) = \frac{1}{1+\exp(\beta' x_i)} = \frac{1}{1+\exp[-(\alpha+\beta_1 x_{i1}+\ldots+\beta_k x_{ik})]}$$

	Constant	WC/TA	RE/TA	GEAR	AR/TA	SHIP
Coefficient	-15.693*	-13.335*	-9.262**	18.398*	3.955*	-28.868*
	(5.111)	(5.086)	(4.023)	(6.045)	(1.084)	(11.92)
Tolerance Statistic		0.84	0.75	0.79	0.68	0.80
LR Statistic (5 df)	47.53					
	[0.00]					
McFadden R-squared	0.829					
H-L Statistic	1.947					
	[0.98]					

- *, ** indicates significance at the 99% and 95% confidence level respectively.
- values in ( ) and [ ] are standard errors and p-values respectively.
- LR statistic tests the joint null hypothesis that all slope coefficients except the constant are zero. It is used to test the overall significance of the model and the number in parentheses is the degrees of freedom, which is the number of restrictions under test.
- H-L Statistic is the Hosmer and Lemeshow (1989) test statistic; lower values and higher p-values indicate a good fit.
- Tolerance Statistic is the test for multicollinearity problems of Lewis-Beck (1980); as a rule of thumb, tolerance statistics lower than 0.2 indicate the presence of multicollinearity.

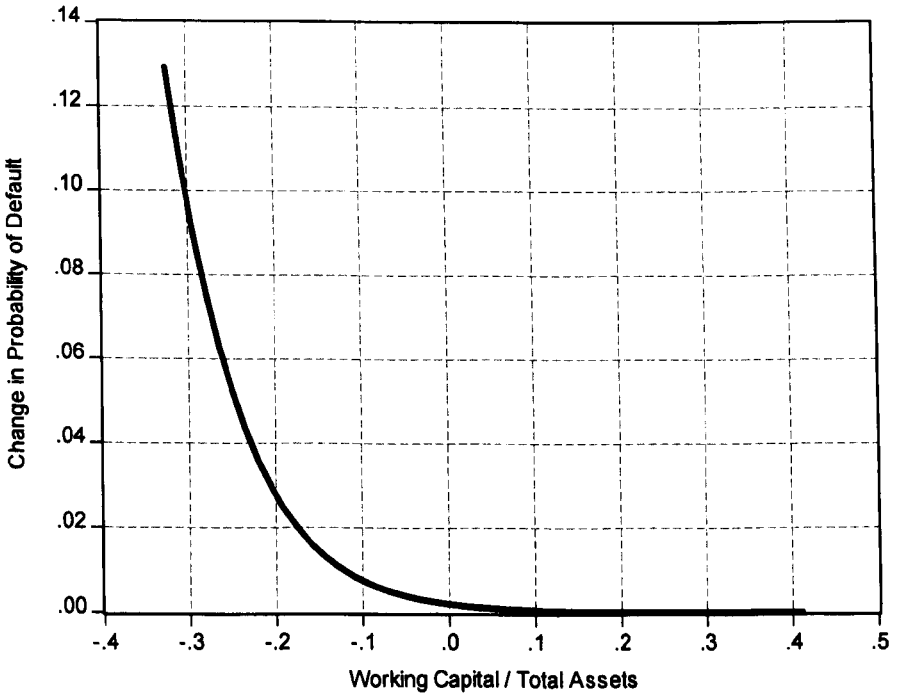
The likelihood ratio statistic is significant at the 5% confidence interval and, thus, the null hypothesis that the non-intercept coefficients are simultaneously equal to zero is rejected. Furthermore, the McFadden R-square stands at 0.829, indicating a good fit. Additionally, in order to evaluate how effectively the estimated model describes the dependent variable, the Hosmer and Lemeshow (1989) goodness-of-fit is also applied; lower values of the H-L statistic and higher p-values indicate a good fit to the data and, therefore, a good overall model fit. The H-L statistic and p-value of 1.94 and 0.98, respectively, confirm the goodness-of-fit of the estimated model. Each slope coefficient in the model is the partial slope coefficient, and measures the change in the estimated logit model for a unit change in the

value of the given regressor. In summary, our model suggests that there is a positive relationship between the probability of default and both gearing, and the amount raised over total assets ratio; on the other hand, the working capital over total assets ratio, the retained earnings over total assets ratio, and SHIP, are negatively related to the probability of default. Finally, we should also mention that the working capital over total assets and retained earnings over total assets ratios are two of the main significant ratios in Altman's (1968) Z-score model.

In order to see how the probability of default responds to changes in the explanatory variables, we transform the estimates of our model into yield estimates of the marginal effects – that is, the change in predicted probability associated with changes in the explanatory variables. The marginal effects are nonlinear functions of the parameters' estimates and the levels of the explanatory variables (Anderson and Newell, 2003). For instance, the marginal effect of x_j on the default probability is given by: $\frac{\partial \mathrm{E}(y_i|\chi_i,\beta)}{\partial \chi_{ij}} = f(-\chi_i'\beta)\beta_j$, where $f(x) = dF(x)/dx$ is the density function corresponding to F. The direction of the effect of a change in x_j depends only on the sign of the β_j coefficient. The following graphs illustrate the marginal effects on the probability of default.

The marginal effect of working capital over total assets is illustrated in figure 4-1. It can be observed that changes of this ratio have a negative effect upon the probability of default. When the ratio is positive, the marginal effect is close to zero. We notice, though, that when a company's working capital over total assets ratio is initially at -30 percent and subsequently rises to 0 percent, then the probability that this company will default decreases by almost 10 percent. Consequently, it is clear from figure 1 that the marginal effects on the probability of default are greater when changes occur at negative levels of this ratio. Looking at table 4-1, we can observe that the average working capital over total assets ratio for the defaulted and non-defaulted companies was around -9 and 4 percent respectively. Thus, there is no doubt that companies with lower working capital over total assets ratio prior to the issue have a higher likelihood to default compared to the non-defaulted ones.

Figure 4-1: Marginal Effect of Working Capital/Total Assets on Default Probability



Turning next to the graph for the retained earnings over total assets ratio, in figure 4-2, we can see that changes in this ratio seem to have a greater impact on the probability to default when they occur between the range of -10 and 20 percent. For instance, when the ratio increases from -10 percent to 20 percent, the probability of default decreases by almost 4 percent. Thus, positive changes in the ratio have an inverse effect on the probability. Nevertheless, even though the marginal effect of this ratio on the probability of default is small in magnitude, it plays an important role in explaining the probability of default; by looking at table 4-1 we can observe that defaulted companies had an average ratio of 7 percent, whereas non-defaulted companies had an average ratio of 26 percent.

Figure 4-2: Marginal Effect of Retained Earnings/Total Assets on Default Probability

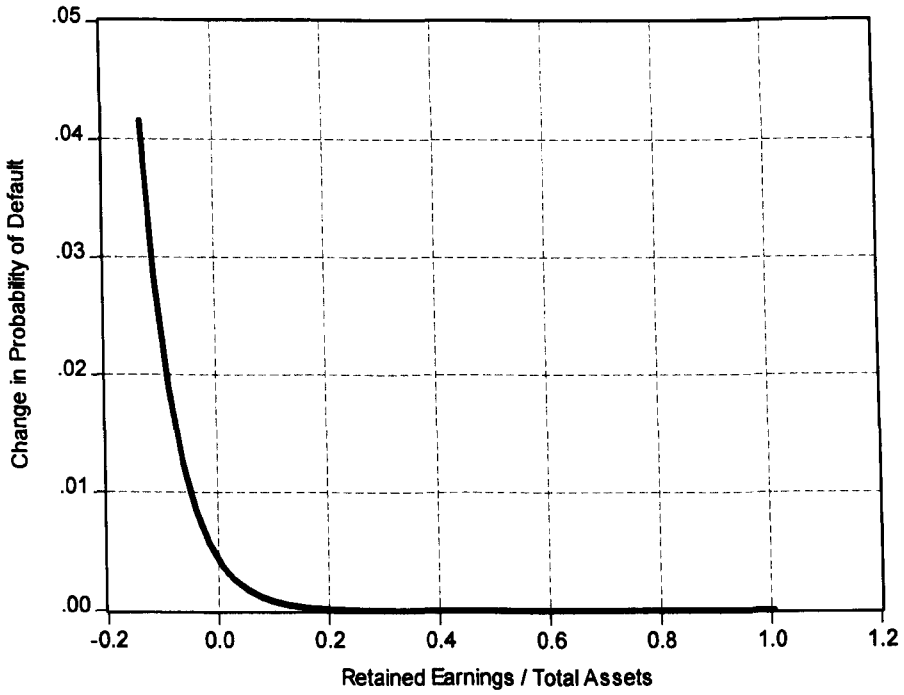


Figure 4-3 shows the marginal effects of gearing ratio on the default probability. It can be observed that a change in the ratio from 0.6 to 0.8 increases the default probability by almost 10 percent. For changes occurring in values lower than 0.6 the marginal effect is zero. In our analysis and as table 4-1 indicates, defaulted and non-defaulted companies had an average gearing ratio of 0.7 and 0.53, respectively.

Figure 4-3: Marginal Effect of Gearing on Default Probability

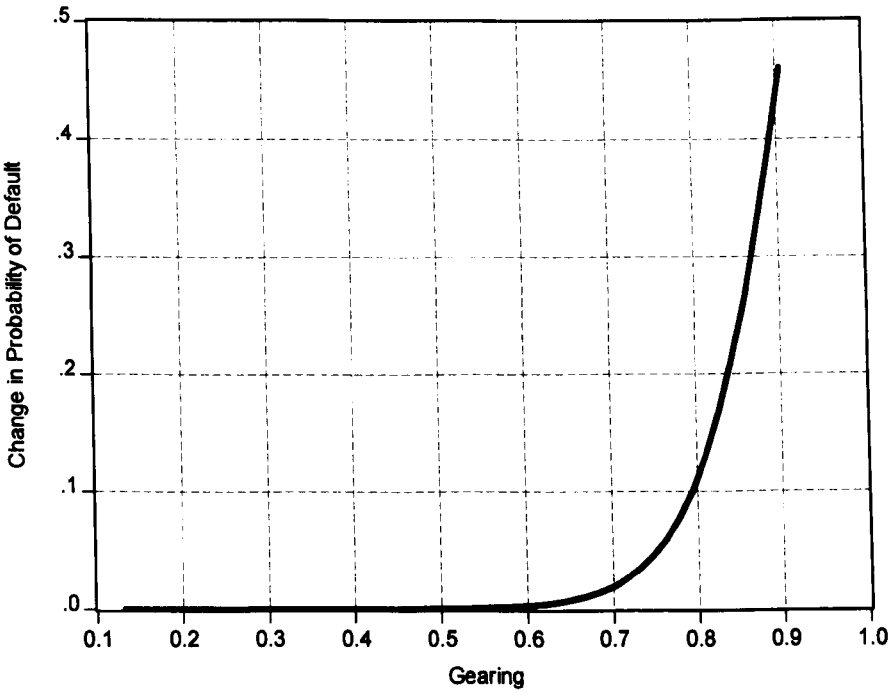
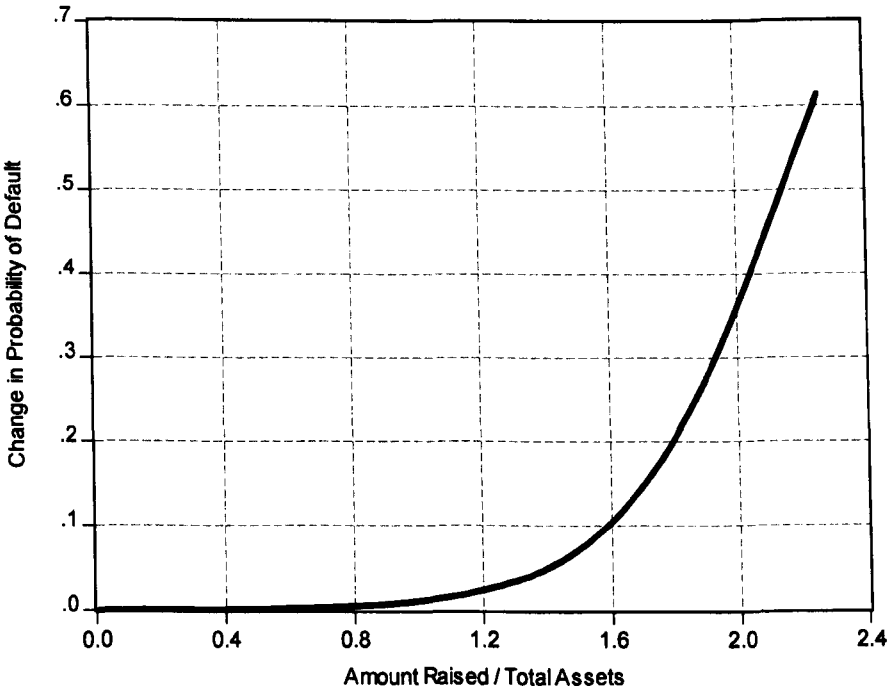


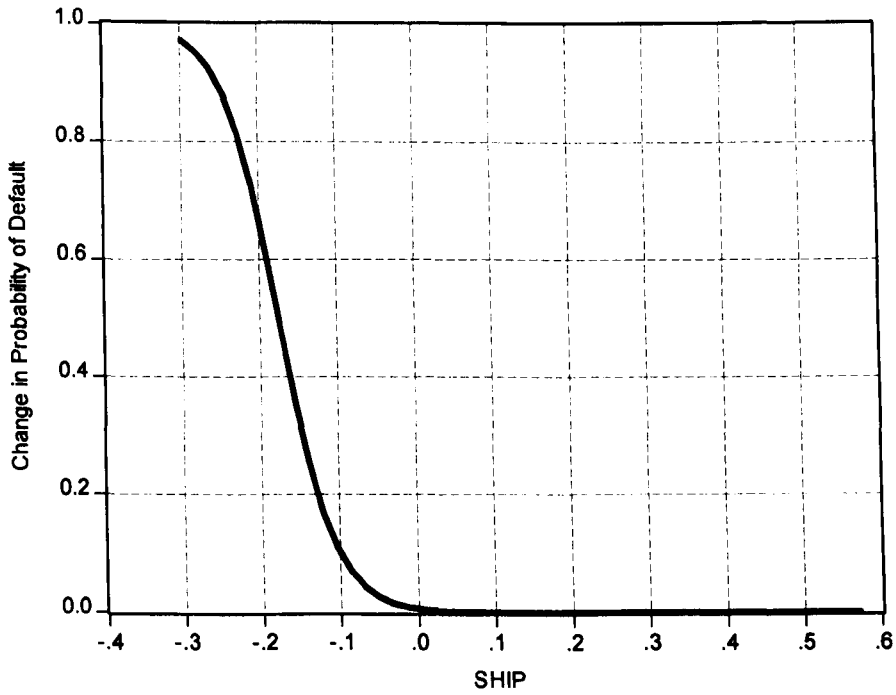
Figure 4-4 illustrates the marginal effects of the amount raised over total assets on the likelihood to default. It can be observed that, when the company's high yield bond issue does not exceed its total assets by more than 80 percent, then changes in this ratio do not have a great impact on altering the probability of that company to default. When the ratio is greater than 80 percent, the marginal effect is larger. For instance, an increase in the ratio from 80 to 180 percent increases the probability to default by almost 20 percent. As a result, it is obvious that this ratio has an impact on the probability of default when shipping companies raise an amount – through their high yield bond issue – that exceeds their total assets by more than 80 percent. Table 4-1 confirms this, as the ratio of the amount raised over total assets for the defaulted and non-defaulted companies is 130 and 28 percent, respectively.

Figure 4-4: Marginal Effect of Amount Raised/Total Assets on Default Probability



Finally, figure 4-5 illustrates the marginal effect of the variable *SHIP* on the default probability; *SHIP* reflects the market conditions at the time of the issue compared to the past 3 year moving average. We can notice that a change in this variable from -15 percent to 0 percent decreases the probability of default by almost 40 percent. Thus, as expected, there is a negative relationship between this variable and the probability of default. In other words, when an issue takes place at a period where the shipping market is performing better than in the last three years, then, the probability of default is also reduced. The fact that the marginal effect of this ratio on the probability of default is zero – when changes occur in the positive territory - can also be confirmed from table 4-1, where we can observe that, for the defaulted and non-defaulted companies, this variable was -4 and 13.5 percent, respectively.

Figure 4-5: Marginal Effect of SHIP on Default Probability



The model's ability to predict the probability of default is examined next. The overall prediction rates of the model are not meaningful without taking into consideration the Type I and Type II errors (Zavgren, 1983). A Type I error occurs when the model predicts that a bond will not default when it actually does. A Type II error occurs when the model predicts that a bond will default when it does not. Table 4-3 depicts the actual number and percent of issues correctly classified and misclassified by our model given a specified cut-off probability - here set to 0.49[18]. In the overall sample, our model correctly predicts 36 out of the 37 issues (97.30%) that have not defaulted, and 12 out of 13 issues (92.31%) that have defaulted.

[18] Instead of relying on a simple à priori cut-off probability of 0.5, we calculate the optimal cut-off probability according to Palepu (1986). The condition that will allow us to determine the optimal cut-off probability is the following: $\frac{f_1(p|i = defaulted)}{f_2(p|i = non-defaulted)} \geq 1$

where $f_1(\ )$ is the distribution of defaulted issues and $f_2(\ )$ is the corresponding distribution for non-defaulted issues. To determine the optimal cut-off probability we first estimate the conditional probability density functions of $f_1(\ )$ and $f_2(\ )$ by plotting the distribution of the estimated probabilities for the defaulted and non-defaulted issues that are used to estimate the model parameters. The optimal cut-off probability is the value where the two plots intersect.

Overall, the estimated model correctly predicts 96 percent of the observations and the Type II error is 2.70 percent, whereas the Type I error is 7.69 percent[19].

Table 4-3: Prediction Table of Models

	Number Correct	*% Correct*	*Number Incorrect*	*Type I / Type II Error %*
Defaulted Issues	12	92.31	1	7.69 (Type I)
Non-Defaulted Issues	36	97.30	1	2.70 (Type II)
Total	48	96.00	2	

Although our model predicts correctly more than 90 percent of the defaulted and non-defaulted issues, one criticism may be the fact that the total number of observations in our sample is small. In order to test the robustness of our model further, we ran additional in- and-out of-sample tests using simulation techniques[20]. Our approach was as follows: from the overall sample of 50 observations, we randomly selected 45 issues and estimated the logit model described in the previous section for these issues only; this sample of 45 issues forms the basis for the simulated in-sample results. The remaining 5 observations are then used to assess how well the model performs on an out-of-sample basis. This process is then repeated 5,000 times, selecting a different random sample of 45 companies each time.

Table 4-4 – panel A presents the empirical confidence intervals for the coefficients of the in-sample model. As we can observe, the values of the original model, in table 4-2, lie in the 95 percent confidence interval given by the in-sample model and are very close to the median of the empirical estimates. In addition, in all cases the estimated coefficients are significantly different from zero. Table 4-4 – panel B indicates that the in-sample model – on average – can correctly predict 92.29 percent of the defaulted issues and 98.07 percent of the non-defaulted issues. In addition, the in-sample model correctly predicts 96.57 percent of the overall observations and the Type I and Type II errors are low at 7.67 percent and 1.93

[19] Our model was also compared to a model including only credit rating as an explanatory variable. The reason behind this comparison was the following: credit ratings are supposed to have taken into account the different financial ratios of the company when assigning their rating; as a result, we wanted to check whether our model was better in predicting default compared to the one where only credit rating is used. The comparison showed that our model outperformed the credit rating based model.

[20] Bootstrap technique has been used previously in failure prediction studies in order to validate the results of their models [Charitou et al. (2004), Barniv et al. (2002), Huffman and Ward (1996), Boritz et al. (1995), Platt and Platt (1990)].

percent, respectively. Turning next to the out-of-sample tests, we can see that the model can correctly forecast – on average – 74.64 percent of the defaulted issues and 92.34 percent of the non-defaulted issues. Furthermore, the overall prediction stands at 87.83 percent. On the whole, the results further indicate the robustness of our original model in predicting the default of shipping high yield bonds.

Table 4-4: In-Sample Logit Model for Predicting the Probability of Default for Shipping High Yield Bond Issues (Panel A) (45 Randomly Selected issues – 95 % Confidence Interval)

$$F(-\beta' x_i) = \frac{1}{1+\exp(\beta' x_i)} = \frac{1}{1+\exp[-(\alpha + \beta_1 x_{i1} + \ldots + \beta_k x_{ik})]}$$

	Constant	WC/TA	RE/TA	GEAR	AR/TA	SHIP
@0.025	-239.87	-1451.6	-521.67	7.324	3.495	-708.08
@0. 50	-15.455	-13.029	-9.206	18.048	3.937	-28.379
@0.975	-7.654	-9.719	-6.474	298.55	40.882	-20.743

Table 4 – Panel B: Percent Correctly Classified in the In and out-of Sample Model - Average Values

	Defaulted Issues				*Non-Defaulted Issues*				
	Number Correct	*% Correct*	*Number Incorrect*	*Type I Error %*	*Number Correct*	*% Correct*	*Number Incorrect*	*Type II Error %*	*Total % Correct*
In-Sample	10.83	92.29	0.90	7.67	32.63	98.07	0.64	1.93	96.57
Out-of-Sample	0.94	74.64	0.32	-	3.44	92.34	0.29	-	87.83

- The Type I and Type II errors in the out-of-sample model are omitted as they cannot be estimated reliably due to the small sample size (5 issues).

4.5) Conclusions

In this paper we examined how shipping high yield bond defaults can be predicted at the time of the issue by using a combination of financial ratios and industry specific variables. The key financial variables that are associated with the probability of default are: the gearing ratio, the amount raised over total assets ratio, the working capital over total assets ratio, the retained earnings over total assets ratio and an industry specific variable that captures the shipping market conditions at the time of issuance.

The estimation results of the logit model indicate that higher gearing levels are associated with higher probabilities of default and that changes in the ratio – when these occur at levels above 65 percent – are positively related to the probability of default. Similarly, when companies raise an amount that exceeds their total assets by 80 percent or more, then the probability of default will also be high. On the other hand, the variable capturing the

shipping market conditions is negatively related to the default probability of a company that issues high yield bonds; additionally, the working capital over total assets ratio, and the retained earnings over total assets ratio are also negatively related to the probability of default.

Our results have implications for both investors and shipowners. By employing easily accessible and quantifiable variables at the time of issuance, investors can identify which issues have a high likelihood to default, thus, assisting their investment decisions. In addition, shipowners who plan to issue high yield bonds can identify the factors on which they need to focus in order to offer an issue that does not entail a high probability of default and, thus, is more attractive to investors. In particular, our results outline the importance of leverage and cash flow strength. Therefore, shipowners – who wish to offer high yield bond issues – may be better off by focusing on their companies' income stability which would, consequently, be adequate in servicing their debt obligations; and income stability could be achieved by offering better quality of services in order to attract first class charterers and longer chartering contracts.

Chapter 5. US Shipping Initial Public Offerings: Do Prospectus and Market Information Matter?

Under Review:
Transportation Research Part E: Logistics and transportation Review

5.1) Introduction

Over the past few years, and especially during the shipping boom of 2002-2008, we have witnessed an increase in the number of shipping companies entering the US equity capital markets[1]. Undoubtedly, a large number of shipping companies consider the capital markets as an essential part of their strategy for optimizing financial management, through a combination of traditional bank lending, private placements and public issues of debt and equity. The main reasons for the above are: (1) the temporary difficulty of the banking system to provide on time the necessary funds for newbuilding and/or second-hand purchases; this happened during the banking crisis of 1982-85 and the world financial crisis of 2008-2010; (2) the depletion of the equity base of shipping companies in the mid 1980's; (3) the recent large scale vessel replacement programme; (4) the high vessel prices in 1999s and 2000s; (5) the need to increase the size of the shipping companies; and (6) the emergence of a new generation of shipowners with a different academic background and more liberal philosophy towards the ownership of the vessel.

Grammenos and Marcoulis (1996) are the first to document that during the period 1983 to 1995 the number and size of shipping companies entering the equity capital markets has increased. According to the results of their study, companies entering the equity markets for debt repayment purposes appear to be on average larger in size than those entering the equity markets for vessel acquisitions purposes. In addition, vessel acquisition appears to be the main purpose for going public (63%) followed by asset play (24%). Debt repayment (13%) constitutes another reason for going public, with only one company deciding to go public for trading activities. On a similar note, in the finance literature, Chemmanur and Fulghieri (1999), and Maksimovic and Pichler (2001) highlight the IPO decision as a strategic move to

[1] For an overview of US equity capital markets as a source of finance for shipping companies see Grammenos and Papapostolou [forthcoming (a)].

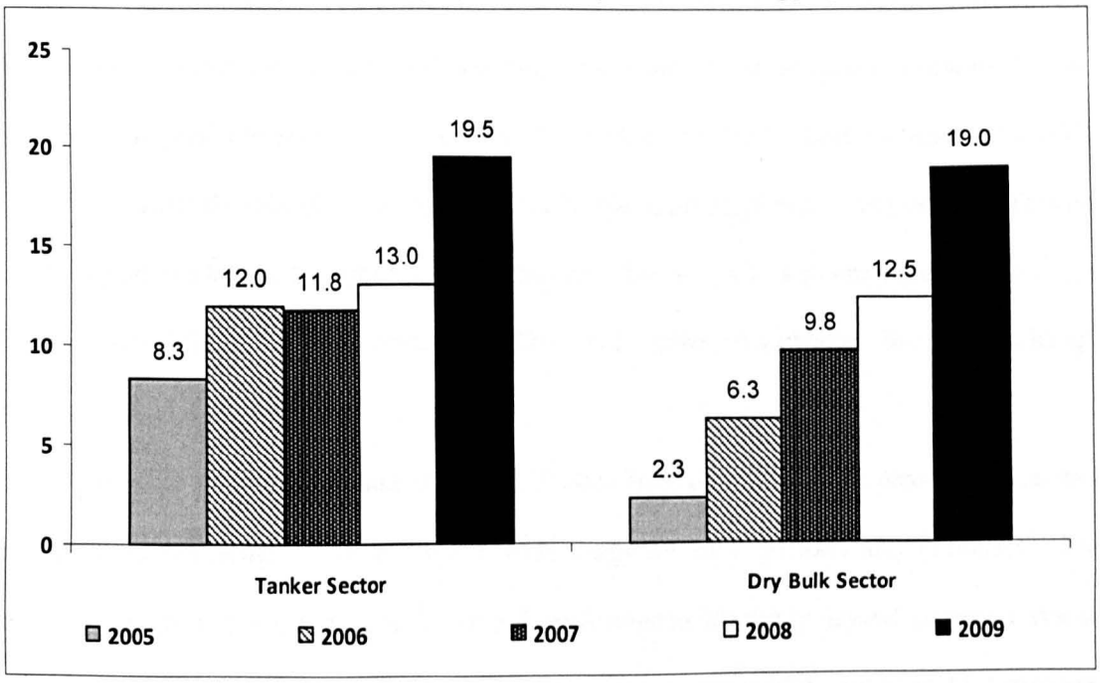
raise equity financing for growth purposes. Furthermore, Kim and Weisbach (2008) find that funds raised by an IPO are used for several purposes in addition to financing growth, such as rebalancing leverage and increasing cash balances.

Shipping stocks should be more closely followed by investors for a number of reasons. First, due to the underlying economic fundamentals of the shipping industry and the fact that the majority of goods transported around the world, i.e. international trade is conducted through seaborne trade. Global shipping and the price industrial companies are willing to pay to ship goods across the world are good indicators of the supply and demand for international trade. Since the demand for international trade, thus seaborne trade, is directly linked to economic growth around the world (Stopford, 2009), shipping may be used as an economic indicator by economists.

Second, it is due to the fact that the increased number of shipping initial public offerings (IPOs) resulted in the shipping industry gaining a higher profile in the global investment stage and, at the same time, China's economic boom also helped the industry to become a mainstream investment theme. Such exposure has made shipping companies a target of private equity and attracted the interest of institutional investors[2]. Furthermore, over the last years, the increase in the number of analysts covering shipping stocks (see figure 5.1) may be another indication that shipping stocks and the shipping industry are increasingly regarded by investors as a mainstream investment opportunity rather than a niche sector for few specialised investors as it used to be in the past.

[2] For instance, Overseas Shipholding Group has 387 institutional investors with their share in the company accounting for 88.82 percent. Other notable examples are Genco Shipping & Trading, Alexander & Baldwin Inc. and Horizon Lines Inc. where the holdings of institutional investors are 85.05, 76.42, and 90.90 percent respectively (Source: Reuters Thomson Financial Banker One, March 2010).

Figure 5-1: Average Number of Analyst Coverage per Share
Source: Norton (2008), Jefferies & Co, and Bornozis (2010), Capital Link. Tanker companies include: Frontline Ltd. (FRO); General Maritime Corp. (GMR); Nordic American Tankers (NAT); and Overseas Shipholding Group (OSG). Drybulk companies include: Diana Shipping Inc. (DSX); Dryships Inc. (DRYS); Eagle Bulk Shipping Inc. (EGLE); and Genco Shipping & Trading Ltd. (GNK).



Third, public shipping companies listed in the US equity capital markets have strengthened their corporate structure. They have become larger in size, due to their growth strategies through mergers and acquisitions[3]; and increased in market value terms due to their share price appreciation. Furthermore, they have become larger not only in market value terms but also in deadweight tonnage terms[4] due to the overall fleet expansion.

Finally, it is the vision of a generation of younger shipowners who have raised finance through growth shipping companies by tapping international capital markets during 1993-

[3] The impact of mergers and acquisitions on the share price of shipping stocks, hence their market value, has been highlighted by Panayides and Gong (2002) who studied the share price reaction to mergers and acquisition announcements in the liner shipping; and by Samitas and Kenourgios (2007) who investigated the case of tramp shipping companies. Both studies concluded that merger and acquisition announcements have positive impact on the stock price of the companies, thus their size.

[4] 8.87 percent of the total (tanker, dry bulk, and container vessels) world deadweight tonnage is controlled by companies who are listed on a US stock exchange; thus, indicating their large size, importance and impact that may have on the shipping industry. In the case of the tanker sector, the fleet of US public shipping companies is even larger in percentage terms of the total deadweight tonnage of the sector, standing at approximately 14 percent. Additionally, these companies, through their public listings and subsequent secondary offerings have also managed to finance their growth plans and create a relatively new fleet compared to the industry's average. On average, dry bulk public companies operate a relative young fleet compared to the sector' s average, where the sector average fleet age is 14.40 years and that of public companies 9.43 years (Source: Clarksons Shipping Intelligence Network, March 2010).

1997 and 2004-2007, and their willingness to continue using equity capital markets as a major source of capital[5].

It is the linkage between international trade, seaborne trade, the world economy and shipping companies; the proportion of shipping stocks held by institutional investors and the increased analysts' coverage for the stocks; the increase in size – both in terms of market capitalisation and deadweight tonnage; and finally, the appetite of young shipowners to utilise equity capital markets as a major source of finance, that led us to a closer examination of the shipping US Initial Public Offerings (IPOs), and more specifically, the underpricing[6] phenomenon.

A number of empirical studies, in the finance literature, document positive initial day returns or underpricing of IPOs over a wide range of time periods and countries[7]. For example, Ibbotson (1975) studies the initial performance of newly issued common stocks offered to the public during the 1960s and finds an average initial return of 11.4 percent; Ibbotson et al. (1988) report an average underpricing of 21 percent for 2,259 firms during 1980-1984, whereas, Ritter and Welch (2002) find an average initial day return of about 19 percent for the period 1980-2001; and, Ritter (2009) documents that for the period 1960-2009 the average initial day return for US IPOs stands at 16.9 percent.

Underpricing is probably the most researched topic in IPO markets and theories regarding underpricing often arise from: 1) informational asymmetries between market participants – the issuer, the underwriter, the initial investors, and the secondary market investors – in the sense that one group of participants has superior information as to the true

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[5] Examples are the 2010 IPOs of Baltic Trading Inc. and Crude Carriers Corp. that raised finance in the US capital markets in order to acquire newbuilding vessels and stating in the prospectus that their growth strategy to further finance future projects will be through equity and no debt.

[6] Underpricing represents money "left on the table" that the new IPO firm forgoes. In other words, this money accrues to initial investors in an IPO but not the pre-IPO owners of the IPO firm Daily et al., (2005). Following Dunbar (2000) and Ljungqvist and Wilhelm (2003), among others, we proxy underpricing with the difference between the closing price on the first day of trading and the initial offer price expressed as a percentage of the initial offer price: $R_{FD} = \left[\frac{\left(CP_{FD} - P_{offer}\right)}{P_{offer}}\right] \times 100$

where: R_{FD} = First day return, CP_{FD} = First day closing price, P_{offer} = Offer price.

[7] For an updated table of underpricing on different countries (Loughran et al., 1994), see https://bear.warrington.ufl.edu/ritter.Int.pdf.

value of the issuing company compared to the rest; 2) symmetric information theories (Ritter and Welch, 2002)[8]. Theories based on asymmetric information[9] include: 1) the Winner's Curse theory (Rock, 1986), 2) the Information disclosure theory (Benveniste and Spindt, 1989), 3) the Principal – agent theory (Baron, 1982), and 4) the Signalling theory (Allen and Faulhaber, 1989). On the other hand, theories that rely on the symmetric assumption[10] include: 1) the Legal liability theory (Tinic, 1988), and 2) the Prospect theory (Loughran and Ritter, 2002).

The use of financial ratios and other information obtained from the IPO prospectus and their impact on the final IPO offer prices has been investigated previously. Kim et al. (1995) find evidence that the offer price is significantly affected by prospectus variables, such as earnings per share, offer size, industry-wide prospects and the offer type. Klein (1996) investigates the significance of prospectus related variables and concludes that accounting information is important in the pricing of IPOs. Kim and Ritter (1999) argue that accounting comparables[11], without further adjustments, have modest explanatory power on the IPO price. In particular, they argue that their model's explanatory power improves when they use forecast earnings for the following year rather than pre-IPO historical earnings. Hand (2003) demonstrates a model of accounting data which is useful in explaining the IPO offer price of internet companies as well as the market prices over the subsequent two years. In addition, Bhabra and Pettway (2003) use prospectus data and show that financial and operating

[8] Ljungqvist (2006) has classified the theories into four categories: asymmetric information theories; ownership and control theories, institutional theories; and behavioural theories.
[9] The Winner's curse theory is based on informed versus uniformed investors and empirical research on this theory can be found in Keloharju (1993), and Lee et al. (1999). The Information disclosure theory is based on the fact that underwriters can obtain information from informed investors during the IPO process; work on this theory includes Hanley (1993), Cornelli and Goldreich (2001, 2003) and, Jenkinson and Jones (2004). The Principal-agent theory assumes that issuers are less informed than underwriters, whereas the Signalling theory assumes the opposite, issuers are more informed than underwriters (Ljungvist and Wilhelm, 2003; Michaely and Shaw, 1994; Welch, 1989).
[10] The Legal liability theory assumes that underpricing takes place in order to reduce possible future litigation from investors (Lowry and Shu, 2002). The Prospect theory argues that issuers permit underpricing because their wealth gain from the IPO is greater (Ljungqvist and Wilhelm, 2005).
[11] The variables tested are the price-earnings (P/E) ratio, market-to-book ratio, and price-to-sales ratio.

characteristics, as well as offering characteristics have limited relation with the one-year stock returns[12].

In the shipping finance literature, Grammenos and Marcoulis (1996) is the first study to examine shipping IPOs initial day returns in a cross-country framework and the results show that gearing appears to be statistically significant and positively related to initial day returns of shipping IPOs; furthermore, underpricing is found to be of small magnitude and on average standing at 5.32 percent. Cullinane and Gong (2002) investigate the transportation IPOs in the China mainland and Hong Kong and find evidence that freight related IPOs are subject to more severe underpricing than non-freight related IPOs, 104.95 percent and 19.17 percent respectively. Merikas et al. (2009) investigate global shipping IPOs and find an average underpricing of 17.69 percent. Additionally, the study examines factors that may explain first trading day returns and concludes that underpricing is positively related to the age of the firm, the reputation of the stock market, and the IPO market conditions prevailing at the time of the issue; on the other hand, the reputation of the underwriter affects underpricing negatively. On a similar note, Merikas et al. (2010) examine shipping initial public offerings in the US for the period 1987 - 2007 and find an average underpricing of 4.4 percent. Finally, our study finds that shipping US IPOs have on average a 2.69 percent initial day return; whereas, when the sample is categorised into underpriced and overpriced issues, the average first day return is 8.53 and -3.87 percent respectively.

This chapter focuses on two asymmetric information theories for explaining underpricing, the factors that affect the initial day returns, and the probability of underpricing a shipping IPO. More specifically, we use information provided in the IPO prospectus, and alongside with market related variables, we examine their usefulness in testing the partial adjustment theory of Benveniste and Spindt (1989) and Rock's (1986) winner's curse theory; additionally, using the same set of variables we examine the probability of underpricing a US shipping IPO. The study contributes to the existing shipping finance literature by testing the

[12] The study employs firm characteristics such as: leverage, total assets and sales, spending on Research and Development (R&D) and profitability. Other studies on the same topic include Levis (1993); Loughran and Ritter (1995); Lee et al. (1996); Chen et al. (2001).

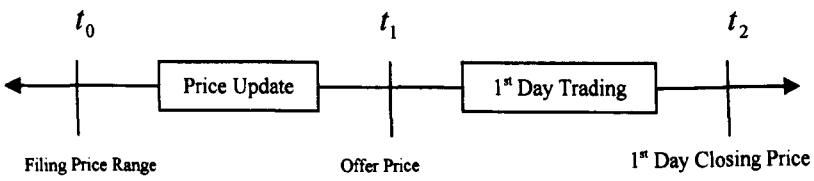
hypotheses of partial adjustment and winner's curse theories as an explanation for shipping IPOs initial day returns. Moreover, we use variables that have not been previously employed in shipping studies and we also examine the probability of underpricing of shipping IPOs for the first time. The results of our study show that by employing readily available information prior to the IPO, the factors that affect the initial day returns of shipping IPOs can be identified and the probability of underpricing a shipping initial public offering can also be predicted.

The rest of the chapter is organised as follows. Section 5.2 describes the initial public offering procedure and the hypotheses being testing. The possible variables to be employed in the analysis and their descriptive statistics are presented in Section 5.3. The empirical results are laid out in Section 5.4, and Section 5.5 concludes the chapter.

5.2) Background and Testable Hypotheses

The pricing of an IPO occurs in two stages (t_0 and t_1) and the underpricing level is determined in the third stage (t_2) as shown below. It begins at the time the underwriter performs an initial due diligence investigation and a preliminary prospectus is filed with the Securities and Exchange Commission (SEC). In this preliminary prospectus[13], the underwriters set a range of prices within which they expect to set the offer price. The midpoint of the range is normally used as an estimate of the expected final offer price (stage t_0). Between stages t_0 and t_1, the road show takes place where the underwriters receive indications of interest from investors and can gauge the demand for the specific issue. In the second stage t_1, typically after the market closes on the day before the offering, the final offer price is set by the underwriters; this is the price at which the issue is offered to the public. Finally, between stages t_1 and t_2, the stock starts trading and the market assesses the value of the company; and in stage t_2 , the initial day return is calculated based on the closing price and the offer price.

[13] According to Bhabra and Pettway (2003) a detailed prospectus is required before new shares can be offered to the public in an initial public offering. The prospectus provides information about the offering, a brief history of the company and its business, the growth strategy, historical financial information, ownership details, and the risks associated with the issue. Additionally, the prospectus is a legal document that protects the issuer and the underwriter in the sense that it is a written proof that the investor is provided with all the relevant facts associated with the offering. In other words, the prospectus is often the first window to a potential investor about the company's past performance and its growth prospects.



IPO Pricing and Underpricing Timeline, adopted from Lowry and Schwert (2004)

According to Benveniste and Spindt (1989) underwriters must compensate those investors who provide private information regarding the value of the issue by only partially incorporating the information into the final offer price and the rest of the adjustment coming in the form of underpricing. During the road show, underwriters collect indications for the demand of the issue by private/institutional investors. After collecting investors' interest, underwriters allocate only a few shares (or no shares at all) to investors who demanded/bid in a conservative way. On the other hand, investors who demanded/bid the shares aggressively, hence revealing positive information about the IPO, are rewarded with large allocations of shares. Hanley (1993) is the first to test this theory and finds that upward offer price revisions are positively related to first trading day returns. Similarly, Cornelli and Goldreich (2001) show that the private information gained during the registration period is only partially incorporated into the offer price. Finally, Ljungqvist and Wilhelm (2002) find that institutions which reveal more valuable and positive information during the registration period are rewarded with higher allocations of the issue.

If private information, obtained prior to the offer date, is partially incorporated in the final offer price, then the price update variable (see next section for a description of this variable) should be significant in explaining the first trading day returns of shipping IPOs. Hence, the first hypothesis to test is the following:

Hypothesis 1: testing information disclosure theory

(Benveniste and Spindt, 1989)

H_0: first trading day return of a shipping IPO can be explained by the final offer price revision.

H_1: first trading day return of a shipping IPO cannot be explained by the final offer price revision.

One of the best known asymmetric information theories explaining underpricing is the winner's curse of Rock (1986). Rock (1986) argues that some investors have superior information and are better informed about the true value of the shares offered by a company. Furthermore, he argues that informed investors demand/bid only attractive IPOs, whereas uninformed investors demand/bid IPOs in a random way. Consequently, the winner's curse imposes that in unattractive IPOs uninformed investors receive all the shares they have demanded/bid, while in attractive IPOs their demand/bids is partially crowded out by the informed investors. Financial information, issue specific characteristics, and market specific data constitute information readily available to all potential investors. Finding statistical significance for these variables would leave less room for Rock's (1986) winner's curse theory that some investors have superior information and uninformed investors cannot identify which IPOs are likely to be underpriced. As a result, the second hypothesis to test is the following:

Hypothesis 2: testing winner's curse theory

(Rock, 1986)

H_0: first trading day return of a shipping IPO can be explained by pre-IPO publicly available information.

H_1: first trading day return of a shipping IPO cannot be explained by pre-IPO publicly available information.

Finally, we examine the statistical importance of the variables employed to test the aforementioned hypotheses in predicting the probability of underpricing shipping IPOs.

5.3) Data and Descriptive Statistics

The data sample consists of 51 shipping US IPOs[14] that took place in the period 1987-2008. Of these 51 IPOs, 24 have been overpriced and 27 have been underpriced. The variables employed in our analysis are categorised into three groups: IPO-specific; market sentiment-specific; and financial-specific. The IPO-specific data, the market sentiment-specific data, and the offering prospecti data are collected from Thomson Reuters Banker One Database and Thomson Reuters Datastream. In the case of the shipping market-sentiment variable, data are collected from Clarksons Shipping Intelligence Network. Finally, the financial-specific[15] data for the companies are collected from the offering prospecti.

5.3.1) Transaction Characteristics

The proceeds raised by the IPO (SIZE) have traditionally been used as a proxy for the risk of the issue. IPOs with large proceeds are considered to be less risky; hence, they command a lower level of underpricing (Chalk and Peavy, 1987; Ibbotson et al., 1994; and Jain and Kini, 2000). To adjust for inflation, the offer proceeds are converted to 1996 dollars using the US Consumer Price Index (CPI), and are then transformed using logarithms to reduce skewness.

Overhang (OVER) is the ratio of retained shares to the public float at the IPO (Bradley and Jordan, 2002). When the number of shares issued in the IPO is small relative to the shares retained by the company's owners or pre-issue shareholders, there will be greater underpricing due to limited supply of shares. Additionally, the higher underpricing can also result from the asymmetric information model of Leland and Pyle (1977). The signalling theory of Leland and Pyle (1977) suggests that the proportion of equity retained by the original owners is positively related to the firm's health. By giving up a small fraction of the

[14] Special Purpose Acquisition Companies (SPACs) IPOs were excluded from our sample because no financial data are available for these companies prior to their public listing debut. Additionally, the sample spans up to 2008 as this is the year when the last shipping company with historical financial information went public. Since then, three shipping companies, with no prior financial information, have entered the US public equity market (Baltic Trading Ltd., Crude Carriers Corp., and Scorpio Tankers Inc.).

[15] The financial data were extracted from the latest end-of-year income statements and balance sheets for the company at the time of the issue.

company in the IPO, owners can signal that the company is of high value and as a result push the price up, leading in that way to undepricing. Bradley and Jordan (2002) find that the retention rate is highly correlated with underpricing and a good predictor of it. Further, Downes and Heinkel (1982) and Jain and Kini (1994) find a significant positive relationship between post-IPO performance and the proportion of equity retained by the owners.

Prior to marketing an IPO, the issuing company and the investment banks are required to file an estimated price range in the registration statement; while, the final offer price is set on the day prior to the offering after receiving indications of interest from potential institutional investors. The final offer price may lie within the original filing price range, above or below it. An offer price set above the initial filing price range indicates strong pre-IPO demand and confidence by institutional investors regarding the prospects of the issuing company. An offer price below the initial filing price range represents weak demand, while an offer price within the range indicates expected demand. We measure pre-IPO demand, which will constitute our price update variable (P_{UPDATE}), according to Derrien (2005). The price update variable is calculated as the final offer price minus the lower bound price of the initial filing price range divided by the width of the initial filing price range. Specifically:

$$WR = \frac{(FPR_U - FPR_L)}{FPR_L}$$

$$P_{UPDATE} = \frac{(Poffer - FPR_L)}{WR}$$

Where, WR *= width of initial price range;* FPR_U *= Upper bound of filing price range;* FPR_L *= Lower bound of filing price range;* P_{UPDATE} *= IPO offer price relative to price range; and* P_{offer} *= IPO offer price.*

In terms of underwriter's reputation (RANK) we first use Carter and Manaster's (1990) ranking measures of underwriter reputation, as updated by Carter, Dark and Sigh (1998) and

Loughran and Ritter (2004)[16]. Underwriter's ranking ranges from zero to nine, with higher rank representing higher reputable underwriters. In general, a ranking of 8 and above reflects high-ranked, prestigious national underwriters. According to the underwriter certification hypothesis by Booth and Smith (1986), higher underwriter's rank has been widely documented to reduce underpricing. Nevertheless, Beatty and Welch (1996), Cooney et al. (2001), and Loughran and Ritter (2004) have seen this negative relationship reversing in the 1990s. In our sample, approximately every shipping issue had at least one leading underwriter with a rank of 8. Hence, one may reach the conclusion that in the case of shipping IPOs underwriter's reputation does not really affect underpricing. We test the significance of underwriter's reputation, as measured by the aforementioned literature/ranking system, and the variable is found to be insignificant.

Since we do not find any statistical significance of underwriter's reputation, we then categorise the underwriters in our sample by the amount raised as in Megginson and Weiss (1991) and Bradley and Jordan (2002). In particular, we measure the reputation of each underwriter by the amount raised by each underwriter over the total amount raised in the shipping US IPO market during our sample period, and the higher the amount raised by an underwriter the higher the reputation:

$$\text{Reputation} = \frac{AR_j}{\sum_{i=1}^{51} AR_i}$$

where AR_j is the amount raised by each underwriter j and i is the company that went public.

Table 5.1 shows that the underwriters with the highest ranking in the shipping IPO arena are Merrill Lynch, UBS, Citigroup, Jefferies & Co, and Cantor Fitzgerald, accounting for almost 45 percent of our sample; where the total amount raised by 51 shipping US IPOs stands at US$7.314 billion with an average deal of approximately US$143.41 million. In our analysis, we assign a dummy value (RANK) equal to one if the lead underwriter has a rank of six and above, and zero otherwise.

[16] The latest update of the rankings, up to 2009, can be found at http://bear.warrington.ufl.edu/ritter/ipodata.htm.

Table 5-1: League Table of US Shipping IPOs Underwriters: This table ranks the underwriters of 51 shipping IPOs according to the amount raised in the period 1989-2008. Ranking varies from 1 to 9, with 9 indicating the highest level of underwriter's ranking. % of total amount raised is defined as the amount raised by an underwriter over the total amount raised for shipping IPOs in our sample period. Average amount raised per deal is defined as the average amount raised by each underwriter. Deals(number) is the number of deals that each underwriter has participated. % of total deals is the number of deals each underwriter has participated over the total number of shipping IPOs in our sample. Deals leading underwriter (number) is defined as the number of deals each underwriter participated as a leading underwriter.

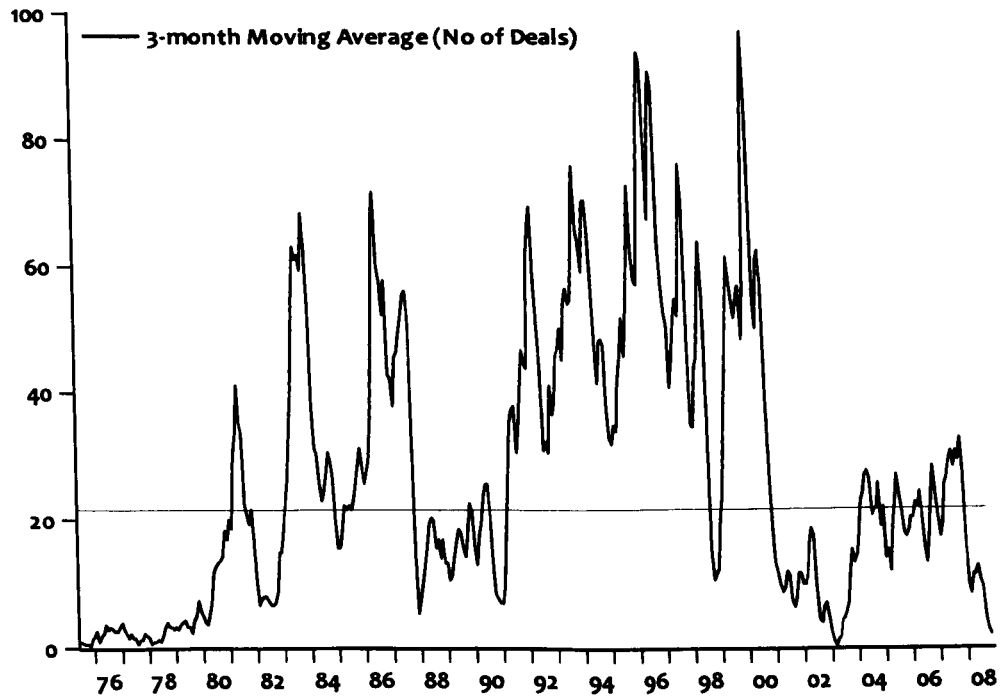
RANK	Underwriter	Amount Raised ($)	% of Total Amount Raised	Average Amount Raised per Deal ($)	Deals (Number)	% of Total Deals	Deals Leading Underwriter (Number)
9	Merrill Lynch	780,895,838	10.67%	43,383,102	16	35.29%	10
	UBS	742,406,038	10.15%	46,400,377	18	31.37%	14
8	Citigroup	686,685,575	9.38%	68,668,558	10	19.61%	10
7	Jefferies & Co	605,964,954	8.28%	35,644,997	17	33.33%	10
6	Cantor Fitzgerald	460,032,250	6.29%	65,718,893	7	13.73%	5
5	Bear Stearns & Co	362,695,375	4.96%	32,972,307	11	21.57%	5
4	Morgan Stanley	282,711,221	3.87%	28,271,122	10	19.61%	5
	Lazard Freres	265,475,046	3.63%	24,134,095	11	21.57%	3
	JP Morgan & Co	237,326,358	3.25%	33,903,765	7	13.73%	3
	Goldman Sachs & Co	226,036,680	3.09%	32,290,954	7	13.73%	6
3	Lehman Brothers	184,919,600	2.53%	23,114,950	8	15.69%	3
	Credit Suisse First Boston	184,093,000	2.52%	20,454,778	9	17.65%	3
	Maxim Group	150,000,000	2.05%	150,000,000	1	1.96%	1
2	Banc of America	145,461,575	1.99%	48,487,192	3	5.88%	2
	Dahlman Rose Weiss	131,131,155	1.79%	13,113,116	10	19.61%	0
	Fortis Securities LLC	122,957,025	1.68%	13,661,892	9	17.65%	1
	Raymond James & Associates	122,208,063	1.67%	6,432,003	19	37.25%	2
	Hibernia Southcoast Capital	116,370,000	1.59%	12,930,000	9	17.65%	2
	Deutsche Bank	98,575,000	1.35%	14,082,143	7	13.73%	1
	Wachovia Securities	85,561,450	1.17%	21,390,363	4	7.84%	0
	Oppenheimer & Co	77,276,005	1.06%	8,586,223	9	17.65%	0
1	154 Underwriters	1,245,150,147	17.05%	-	-	-	30
	Total	7,313,932,353	100%	143,410,438	-	-	-

5.3.2) Market Characteristics

Ibbotson and Jaffe (1975) originally documented the hot issue puzzle where there is a cyclical pattern in the IPO market in which clusters of IPOs have higher than average initial returns. Ritter (1984) extends this study and finds that hot issue markets continue to exist, whereas Loughran and Ritter (2002) and Lowry and Schwert (2002) show that initial returns are positive autocorrelated. Previous studies in the finance literature have defined hot and cold markets on the basis of the monthly IPO volume (Helwege and Liang, 2004; Alti, 2006; Bayless and Chaplinsky, 1996). To define hot and cold months in our analysis, we use a three-month centered moving average of the number of IPOs for each month as it smoothes out seasonal variation (Helwege and Liang, 2004; Alti, 2006). Our sample includes 11,125 US IPOs for the period June 1975-December 2008; financial and REITs[17] IPOs, spinoffs[18], LBOs[19] and IPOs offered at less than $1 per share are excluded. Hot months are defined as those that are above the median in the distribution of the monthly moving average IPO volume across all months in the sample (Alti, 2006). Figure 5.2 plots the monthly moving average IPO volume for the period 1975-2008 and the horizontal line is the median standing at 21.66. For each shipping IPO in our sample, a dummy variable (IPOMKT) is assigned the value of one if the company goes public in a hot month and zero otherwise.

[17] An investment trust that owns and manages a pool of commercial properties and mortgages and other real estate assets.
[18] Spin-off refers to a type of corporate action where a company splits off sections of itself as a separate business.
[19] Company acquisition financed by debt. In practice, a holding company is set up to take on the debt used to finance the acquisition of the target.

Figure 5-2: 3-month Moving Average of IPO volume
Sample includes 11,125 firm-commitment IPOs in the Thomson Reuters Banker One database from June 1975 to December 2008; financial and REITs IPOs, spinoffs, LBOs and IPOs offered less than $1 per share are excluded. The horizontal line is the median monthly IPO volume for the whole sample.



In addition to employing the hot or cold IPO market variable, we use a control variable for the general stock market sentiment[20] and our sample includes daily closing prices of the S&P500 between 31st March 1986 and 1st December 2009. A number of studies note that IPOs take place during positive investor sentiment (Aggrawal and Rivoli, 1990; Pagano, Panetta and Zingales, 1998; Lowry and Schwert, 2002). To define the stock market sentiment (STOCK%) we use the S&P500 cumulative return for the 60 trading days prior to the IPO date[21]. According to Derrien (2005) when the market sentiment is bullish at the time of the offering, the underwriter sets an IPO price that reflects the sentiment. Nevertheless, the high demand due to the bullishness leads to positive initial returns. Similarly, we assume that IPOs taking place during bullish sentiment periods are associated with higher demand than those taking place in neutral or bearish periods; hence, this variable should be positively related

[20] Definitions about sentiment vary in the literature and range from investors' errors to specific psychological biases (Barberis et al., 1998; Brown and Cliff, 2004, Baker and Wurgler, 2007). In this paper we refer to stock market sentiment as the investors' optimism or pessimism about the stock market.

[21] Derrien (2005), and Lowry and Schwert (2002) have employed a similar variable to identify market sentiment.

with first day returns. In a similar way, we use the shipping market earnings to control for the shipping market sentiment (SHIP%); once again, we capture the shipping sentiment by the cumulative returns of the quarter prior to the IPO[22].

5.3.3) Firm Characteristics

We use variables from the IPO prospecti that can proxy the pre-IPO financial status and operational performance of the issuing company; these variables are categorised into liquidity, profitability, efficiency and debt ratios. The liquidity of the company is proxied by the current ratio (CR), which is defined as current assets over currents liabilities. The current ratio (CR) calculates how many times the current assets of the company, normally cash and short-term investments, can cover the current liabilities. Current ratios vary by industry, but generally speaking 1.5 is considered as a healthy current ratio and as the number approaches or falls below 1 special attention is needed to make sure there are no liquidity issues (Leptos-Bourgi, 2009).

As a measure for profitability we use the return on assets (ROA) which is calculated by dividing the net income by total assets. The ratio measures the profitability of the company and shows the company's asset intensity. In other words, it reveals how much profit a company generates for every dollar invested in assets; and the higher this ratio the better. Shipping companies are very capital intensive and require expensive equipment, i.e. vessels, to operate and generate profits. Thus, it is useful to compare the profitability of a shipping company to that of its peers.

To capture the operating efficiency of the shipping company we use the total assets turnover (EFFIC) estimated by dividing the freight revenue over total assets. The efficiency

[22] Our sample contains companies operating in different sectors of the shipping industry. Specifically, the sample includes 24 tanker companies, 14 dry-bulk companies, 5 container companies, 4 offshore companies, 2 chemical companies, and 2 multi-sector (a mix of tanker and dry-bulk) companies. In our analysis, we calculate the SHIP% variable of the different sectors and make sure we use the relevant one for each company. For instance, for the tanker and dry-bulk companies we use the weighted average earnings for each sector respectively; for the container companies we use a time-charter rate index; for the offshore companies we use spot rates; and for the chemical companies we use time-charter rate equivalents, and all the above data is provided by Clarksons Shipping Intelligence Network. In the case of the 2 multi-sector companies we multiply the relevant earnings index by a weight given by the percentage of the company's fleet operating in each segment.

ratio we employ indicates the effectiveness of the company to generate freight revenue with the use of its total asset base, the vessels. The ratio should always be compared to the industry average because it varies greatly between different industries. For example, in capital-intensive companies (steel, autos, and shipping) the total asset turnover ratio is typically less than one (100 in the case the ratio is expressed in percentage terms), while in retail and services companies it may be over ten. Other things being equal, the higher this ratio the better.

To estimate the debt of the company, we employ the gearing ratio (GEAR) defined as the long-term debt over the long-term debt plus the shareholder's equity. This ratio shows at a glance how burdened a company is with debt and measures the ability of the company to survive periods of income instability and recession. High gearing indicates an increasing reliance upon bank funds or other forms of debt for vessel acquisitions, and this may create problems with meeting interest and capital repayments in the case of market conditions deterioration. For instance, shipping companies with high gearing and unstable income generation faced survival problems in the early 1980s, while other companies defaulted in their high yield debt obligations in 1998/1999. On the other hand, during high income periods such as in the late 1980s and in 2003-2008, highly geared companies substantially increased their revenues and expanded. Hence, gearing can be considered as a double-edge sword in the sense that during prosperity periods highly geared companies do not have problems meeting their interest and capital payments, while at times of recession/depression the same companies may face difficulties in meeting their debt obligations. Finally, highly geared companies operating in the spot or in the short-term time-charter markets may be the ones who face the greatest danger in periods of a market downturn.

5.3.4) Descriptive Statistics

Descriptive statistics for the sample in our analysis are presented in table 5.2 which includes the mean and standard deviation values for all issues, the underpriced issues and the overpriced issues, respectively. The p-value of testing the null hypothesis that the mean values of the underpriced and overpriced issues are the same is also presented; a test that may provide a rough indication of the possible explanatory variables for our final model.

Table 5-2: Descriptive Statistics: This table provides descriptive statistics on all issues, undepriced and overpriced issues samples. The p-values of mean comparisons between underpriced and overpriced issues are also presented. The symbols *, **, *** indicate significance at the 10, 5 and 1 percent respectively. Initial trading day return (R_{FD}) is the difference between the closing price on the first day of trading and the initial offer price expressed as a percentage of the initial offer price. IPO proceeds (SIZE) is the logarithmic form of the issue price times the number of shares offered. Overhang (OVER) is defined as the ratio of retained shares to the total public float at the IPO. Price Update (P_{Update}) is calculated as the final offer price minus the lower bound price of the initial filing price range divided by the width of the initial filing price range. Underwriter rank (RANK) is underwriter's reputation calculated using a method similar to Megginson and Weiss [1991] and, Bradley and Jordan [2002] and takes the value of 1 if the underwriter is highly reputable and 0 otherwise. IPO market (IPOMKT) takes the value of 1 if the issue takes place in a hot month and 0 otherwise; hot months are defined as those that are above the median in the distribution of the monthly moving average US IPO volume across all months for the period 1975-1008. Stock market sentiment (STOCK%) is defined as the S&P500 cumulative return for the 60 trading days prior to the IPO date. Shipping Market Sentiment (SHIP%) is defined as the shipping earnings cumulative return for the 60 days prior to the IPO date. Current ratio (CR) is calculated as the current assets over current liabilities. Return on assets (ROA) is defined as the net income over total assets. Total assets turnover (EFFIC) is given by dividing freight revenue over total assets. Gearing (GEAR) is calculated as long-term debt over long-term debt and shareholder's equity.

	All Issues		**Underpriced Issues**		**Overpriced Issues**		
	Mean	St.Deviation	Mean	St.Deviation	Mean	St.Deviation	p-value
First Trading Day Return (%)	2.69	0.091	8.53	0.090	-3.87	0.026	0.06*
Total IPO Proceeds ($m)	148,293,268	92,787,120	163,032,098	109,858,322	131,712,084	67,314,515	0.110
Overhang (%)	45.00	0.276	46.10	0.281	43.80	0.276	0.382
Price Update (%)	1.39	0.165	6.05	0.198	-3.85	0.099	0.013**
Underwriter Rank	0.627	0.488	0.741	0.447	0.500	0.510	0.040**
IPO Market [Hot=1; Cold=0]	0.843	0.367	0.963	0.192	0.708	0.464	0.009***
Stock market Sentiment (%)	5.30	0.084	8.60	0.071	1.70	0.085	0.0015**
Shipping Market Sentiment (%)	14.30	0.466	25.70	0.506	1.50	0.388	0.029**
Current Ratio	1.263	1.296	1.540	1.648	1.018	0.833	0.085*
Return on Assets-ROA - (%)	5.80	0.083	7.60	0.097	3.60	0.059	0.039**
Total Assets Turnover (%)	44.90	0.593	59.20	0.723	28.80	0.351	0.029**
Gearing (%)	62.00	0.231	68.70	0.230	54.50	0.212	0.013**

The average first day return for the US shipping IPOs in our sample stands at 2.69 percent, with underpriced and overpriced issues at 8.53 and -3.87 percent respectively. The average total IPO proceeds for all issues stands at US$148.3 million and it is observed that -

on average - underpriced issues raise more money than overpriced issues, US$163 million and US$131.7 million respectively. In terms of shares retention, it can be argued that all companies retain, on average, around half of the outstanding shares, between 44 and 46 percent. Furthermore, shipping IPOs have on average a positive offer price revision of 1.39 percent, whereas underpriced and overpriced issues have a final offer price revision of 6.05 and -3.85 percent, respectively. Finally, the last IPO-specific variable, the underwriter's ranking has an average value of 0.62 for the entire sample. This means that, on average, 62 percent of shipping US IPOs have a reputable underwriter. For the underpriced and overpriced issues the average stands at 0.74 and 0.5, respectively.

Turning to the market-specific variables we observe that, on average, 84.3 percent of all shipping IPOs in our sample take place during hot IPO markets; 96.3 percent of underpriced issues take place in a hot IPO market and this number drops to 70.8 percent for overpriced issues. In terms of stock market sentiment, shipping companies enter the equity markets at a time when the average 60 day cumulative return of the SP500 prior to the IPO is 5.3 percent; companies with underpriced issues go public when the average cumulative return is 8.6 percent and those with overpriced issues when it is 1.7 percent. Hence, it can be concluded that, on average, underpriced issues take place during much higher (bullish) investor sentiment than overpriced issues. Last, shipping IPOs take place when shipping market returns - on average - are at 14.3, 25.7 and 1.5 percent for all, underpriced, and overpriced issues respectively. Once again, we notice that underpriced issues take place during higher (bullish) shipping sentiment periods.

In terms of current ratio table 5.2 shows that shipping companies entering the US equity market have on average a ratio of 1.26. For companies that their issues are underpriced and overpriced the ratio is 1.54 and 1.01 respectively. Furthermore, the profitability of shipping companies, on average, is 5.8 percent, while for companies with underpriced and overpriced issues is 7.6 and 3.6 percent respectively. The statistics also show that the operating efficiency for shipping companies on average stands at 44.90 percent with the number increasing to 59.20 percent for companies with underpriced issues; while it decreases to 28.80 for

companies with overpriced issues. Finally, the average gearing for all companies is 62 percent while for the underpriced and overpriced issues the average gearing stands at 68.70 and 54.50 percent respectively.

Overall, in respect to the financial-specific variables, we observe that companies with overpriced issues on average tend to have a better financial status in terms of the gearing ratio, whereas underpriced issues in terms of liquidity, profitability and operational efficiency. Finally, the variables that have significantly different means include the offer price revision, the underwriters' reputation, the IPO hot/cold market, the stock and shipping markets sentiment, the current ratio, the returns on assets ratio, the total assets turnover ratio, and the gearing ratio.

5.4) Empirical Results

5.4.1) Explaining First Trading Day Returns

The dependent variable in our regressions is the IPO initial returns, calculated as the percentage change in the first day close price relative to the offer price, and the independent variables are in accordance to the t-tests of mean difference between overpriced and underpriced issues[23]. All variables are observed on the date before the IPO, with the financial specific and the underwriters' ranking available to investors well before the IPO. One possible problem arising from the use of correlated variables is multicollinearity, which may result in biased results. Following Lewis-Beck (1980) that correlation coefficients between the explanatory variables which are greater than 0.8 may indicate the presence of multicollinearity, we examine the bivariate correlations among the independent variables and in all cases correlation coefficients are low and well below 0.8. Additionally, we employ the tolerance statistic[24] (Lewis-Beck, 1980) to check for multicollinearity between the

[23] We do not find any statistical significance and relationship between total IPO proceeds, overhang and initial day returns; and, our final model results do not change by excluding these two variables.
[24] The tolerance statistic[24] is defined as the percentage variance of each independent variable that is not explained by all the other independent variables in the model. If the value of the tolerance statistic for a

independent variables in our model. The tolerance statistics for each independent variables included in our model are presented in table 5.3 and show that our model does not suffer from multicollinearity problems.

given independent variable is close to 0, is an indication that the information the variable provides can be expressed as a linear combination of the other independent variables. As a rule of thumb, only tolerance statistics lower than 20 percent are cause of concern.

Table 5-3: Regressions Models with First Trading Day Return as the Dependent Variable: This table presents the results of our regression models. The adjusted R^2 and the F-Statistic for each regression are reported, with standard errors in parentheses and p-values in [ ]. In addition, the tolerance statistics is reported. The symbols *, **, *** indicate significance at the 10, 5 and 1 percent respectively. The two OLS regressions reported in the table are:

$$R_{FD(t)} = \alpha_0 + b_1 \times P_{UPDATE(t-1)} + \varepsilon_t$$

$$R_{FD(t)} = \alpha_o + b_1 \times P_{UPDATE(t-1)} + b_2 \times RANK_{t-1} + b_3 \times IPOMKT_{t-1} + b_4 \times STOCK\%_{t-1} + b_5 \times SHIP\%_{t-1} + b_6 \times CR_{t-1} + b_7 \times ROA_{t-1} + b_8 \times EFFIC_{t-1} + b_9 \times GEAR_{t-1} + \varepsilon_t$$

Initial trading day return (R_{FD}) is the difference between the closing price on the first day of trading and the initial offer price expressed as a percentage of the initial offer price. Price Update ($PRICE_{Update}$) is calculated as the final offer price minus the lower bound price of the initial filing price range divided by the width of the initial filing price range. Underwriter rank (RANK) is underwriter's reputation calculated using a method similar to Megginson and Weiss [1991] and, Bradley and Jordan [2002] and takes the value of 1 if the underwriter is highly reputable and 0 otherwise. IPO market (IPOMKT) takes the value of 1 if the issue takes place in a hot month and 0 otherwise; hot months are defined as those that are above the median in the distribution of the monthly moving average US IPO volume across all months for the period 1975-1008. Stock market sentiment (STOCK%) is defined as the S&P500 cumulative return for the 60 trading days prior to the IPO date. Shipping Market Sentiment (SHIP%) is defined as the shipping earnings cumulative return for the 60 days prior to the IPO date. Current ratio (CR) is calculated as the current assets over current liabilities. Return on assets (ROA) is defined as the net income over total assets. Total assets turnover (EFFIC) is given by dividing freight revenue over total assets. Gearing (GEAR) is calculated as long-term debt over long-term debt and shareholder's equity.

Regression	Intercept	P_{UPDATE}	RANK	IPOMKT	STOCK%	SHIP%	CR	ROA	EFFIC	GEAR	Adj.R^2	F-Stat
(1)	0.023**	0.258***									0.200	13.692
	(0.011)	(0.000)										[0.00]
	[0.04]	[0.00]										
(2)	-0.139***	0.168***	0.070***	0.027*	0.470***	0.027*	-0.009*	-0.214**	0.064***	0.100***	0.530	6.639
	(0.030)	(0.055)	(0.025)	(0.051)	(0.096)	(0.021)	(0.004)	(0.108)	(0.017)	(0.038)		[0.00]
	[0.00]	[0.00]	[0.00]	[0.10]	[0.00]	[0.10]	[0.06]	[0.05]	[0.00]	[0.01]		
Tolerance stat.		0.737	0.651	0.860	0.830	0.760	0.943	0.787	0.788	0.769		

The first regression in table 5.3 examines the price update variable (P_{UPDATE}) and its explanatory power on shipping IPOs first day returns. The estimated slope coefficient is positively related to shipping IPOs initial day returns and is highly significant. As mentioned earlier, we assume that P_{UPDATE} is a reflection of private information given to the underwriters by the investors during the road show. Therefore, the positive sign of the coefficient and its statistical significance suggest that there is under-adjustment to private information, not contained in the final offer price, which explains about 20 percent of the initial returns for shipping IPOs. More specifically, underwriters of shipping IPOs tend to compensate private/institutional investors for revealing their information about the issuing company during the registration period, and this compensation comes in the form of a partial under-adjustment in the final offer price. The fact that there is partial adjustment to private information in shipping IPOs confirms the Benveniste and Spindt (1989) theory; hence, we cannot reject hypothesis 1.

In the second regression, in addition to the P_{UPDATE} variable, we control for the underwriters' reputation, the market conditions prevailing at the time of the shipping IPOs and the financial status of the issuing company. Namely, we use the underwriter's rank (RANK), whether the shipping IPO takes place in a hot or cold month (IPOMKT), the stock market sentiment (STOCK%), the shipping market sentiment (SHIP%), the current ratio (CR), the returns on assets (ROA), the total asset turnover (EFFIC) and the gearing (GEAR) of the company. The positive relationship between shipping IPO initial day returns and underwriter's rank (RANK) suggests that market investors perceive the reputation of the underwriter as a positive factor for the IPO and it is consistent with the findings in the finance literature (Beatty and Welch, 1996; Cooney et al., 2001; Loughran and Ritter, 2004). In terms of market conditions, all three variables exhibit a positive sign and are statistically significant. This result implies that underwriters tend to underestimate the prevailing market conditions when setting the final offer price. In other words, underwriters tend to only partially incorporate the bullish sentiment in the final offer price. Another explanation may be in accordance to Derrien (2005) who argues that although the IPO offer price is set to reflect the

market sentiment, nevertheless, the high demand due to the bullishness leads to positive initial returns. Finally, regarding the financial status of the company, the current assets (CR) and the return on assets (ROA) are found significant and negatively related to shipping IPO first-day returns. This suggests that underwriters have a tendency to overestimate these two variables when setting the final offer price for a shipping IPO. The total asset turnover (EFFIC) and the gearing ratio (GEAR) are found to be statistically significant and positively related to first day returns. This indicates that underwriters underestimate the gearing and the operational efficiency ratios of the issuing company. The positive sign of the gearing coefficient means that gearing is considered by the market investors as a positive element for the growth of the issuing company in periods of good shipping market conditions. As mentioned earlier, high gearing can be perceived as a positive element for a company during periods of market prosperity and as a bad sign during periods of a market downturn. The fact that the shipping market sentiment and the gearing ratio are both found to be statistically significant and positively related to the first-day returns further confirms the above.

Our results have both theoretical and empirical implications for shipping IPOs. On the theoretical side, explanations of shipping IPO initial day returns that rely on informed and uniformed investors may be difficult to stand alone. Rock's (1986) model assumes the existence of uninformed investors who cannot identify which IPOs are likely to be underpriced, but our results show that no specific expertise is required since all the variables in our model are publicly available prior to the issue. As a result, we cannot reject hypothesis 2. On the empirical side, our variables provide a set of control variables regarding shipping IPOs, and these variables may be useful in analysing shipping IPOs underpricing. To test the empirical usefulness of our results, we examine, in the next section, the probability of a shipping IPO being underpriced by employing the variables of our OLS regression models.

5.4.2) Probability of Underpricing

To determine the relationship between our variables and the probability of shipping IPOs being underpriced we employ the logit technique which creates a score for each company by weighting the independent variables. We assume that the variable $y_i \in \{0,1\}$ is related to an index y_i^* by a linear function of the explanatory variables $x_{i1}, x_{i2}, ..., x_{ik}$ and the random term u_i such that:

$$y_i^* = x_i'\beta + u_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + ,.... + \beta_k x_{ik} + u_i$$

$y_i^* = 1$ if the IPO is underpriced; 0 otherwise.

By this structure we have;

$$\Pr\left(y_i = 1 \middle| x_i'\beta\right) = \Pr\left(y_i^* > 0\right) = \Pr\left(x_i'\beta + u_i\right) = F_u\left(-x_i'\beta\right)$$

where, F_u is the cumulative distribution function of u. We assume that u is logistically distributed and thus:

$$\Pr\left(y_i = 1 \middle| x_i'\beta\right) = F_u\left(-x_i'\beta\right) = \frac{1}{1+\exp\left(x_i'\beta\right)} = \frac{1}{1+\exp\left[-\left(\beta_0 + \beta_1 x_{i1} + ... + \beta_k x_{ik}\right)\right]}$$

where X_i $(i=1,..,k)$ are the independent variables, and β_0 and β_i $(i=1,..,k)$ are the estimated parameters.

The results of the final estimated logit model are presented in table 5.4, panel A, and the final model includes the following variables: P_{UPDATE}, IPOMKT, SPX%, SHIP%, EFFIC, and GEAR[25]. The likelihood ratio statistic is significant at the 5 percent confidence interval,

[25] The CR, ROA, and RANK variables were found insignificant in explaining the probability of underpricing and were drop from our logit model. This does not change the statistical significance of the remaining variables.

thus, the null hypothesis that the non-intercept coefficients are simultaneously equal to zero is rejected. Further, the McFadden R^2 stands at 65.6 percent indicating a good fit. To evaluate how effectively the estimated model describes the dependent variable we perform the Hosmer and Lemeshow (1989) goodness-of-fit test; the Hosmer-Lemeshow statistic and chi-square p-value of 1.557 and 0.99, respectively, confirm the goodness-of-fit of the estimated model.

Each coefficient in the model is the partial slope coefficient, and measures the change in the estimated logit model for a unit change in the value of the given regressor. Our model suggests that there is a positive relationship between the probability of underpricing and the price update variable; thus, shipping issues have a higher probability of underpricing when there is a higher final offer price revision. A result that agrees with the descriptive statistics in table 5.2 which shows that underpriced issues have, on average, an upward price revision of 6.05 percent compared to a downward price revision of 3.85 percent for the overpriced issues. Similarly, the condition of the IPO market, the stock market sentiment, and the shipping market sentiment are also positively related to the probability of underpricing. As a result, it can be argued that, when the stock and shipping market sentiments are bullish the probability that a shipping IPO will be underpriced is also higher. Similarly, the probability of underpricing a shipping issue that takes place during a hot month is also higher. All the above results further confirm the descriptive statistics (see table 5.2) where it is found that underpriced issues on average, compared to the overpriced issues, mainly take place during hot months, and bullish stock and shipping market sentiment.

Similarly, the total assets turnover is also found to be positively related to underpricing. This result suggests that companies with strong operational efficiency, in terms of total assets turnover have their issues underpriced by underwriters. This result may mean that underwriters underestimate the operating efficiency of the company when pricing a shipping IPO.

Gearing is found to be significant in explaining the probability of underpricing and positively related to the likelihood of underpricing. As mentioned earlier, gearing can be considered as a double edged sword. Hence, the positive sign of the variable implies two

possibilities: first, higher gearing entails higher risk and, thus, an issue is underpriced by underwriters in order to reflect the risk profile of the company going public, a result similar to the Grammenos and Marcoulis (1996) study; second, the fact that the shipping sentiment is also found to be positively related to the probability of underpricing may mean that high gearing is perceived as a growth sign during prosperity periods and as a sign of higher risk during bad shipping market conditions. Consequently, we can conclude that the latter explanation about gearing and the probability of underpricing is more appealing.

In the previous section we established, on the theoretical part, that the final offer price is partially adjusted to public available information; our logit model further strengthens that result from an empirical point of view. Overall, the results of our logit model indicate that by employing publicly available data, accessible to investors prior to the IPO, the probability of underpricing of US shipping IPOs can be estimated. Furthermore, we observe that the liquidity and profitability ratios do not play a role in whether a shipping IPO will be underpriced or not; whereas, in the OLS model were both found to be negatively affecting first day returns. This may lead to the conclusion that underwriters, when setting the final offer price may overestimate the current and return-on-assets ratios, but when it comes to measuring underpricing or overpricing, investors prefer to base their investment decisions on the operational efficiency and gearing level of the company.

Table 5-4: Logit Model and Evaluation Results:

$$\Pr(y_i = 1 | x_i'\beta) = F_u(-x_i'\beta) = \frac{1}{1+\exp(x_i'\beta)} = \frac{1}{1+\exp[-(\beta_0 + \beta_1 x_{i1} + ... + \beta_k x_{ik})]}$$

The McFadden R^2 and the LR-Statistic for each regression are reported, with standard errors in. In addition, the Hosmer-Lemeshow (1989) goodness-of-fit test and the tolerance statistic is reported. The symbols *, **, *** indicate significance at the 10, 5 and 1 percent respectively. The dependant variable in the model takes the value of 1 if the issue is underpriced and 0 otherwise. Price Update (P_{Update}) is calculated as the final offer price minus the lower bound price of the initial filing price range divided by the width of the initial filing price range. IPO market (IPOMKT) takes the value of 1 if the issue takes place in a hot month and 0 otherwise; hot months are defined as those that are above the median in the distribution of the monthly moving average US IPO volume across all months for the period 1975-1008. Stock market sentiment (STOCK%) is defined as the S&P500 cumulative return for the 60 trading days prior to the IPO date. Shipping Market Sentiment (SHIP%) is defined as the shipping earnings cumulative return for the 60 days prior to the IPO date. Total assets turnover (EFFIC) is given by dividing freight revenue over total assets. Gearing (GEAR) is calculated as long-term debt over long-term debt and shareholder's equity. Panel B presents the expectation-prediction table alongside with the type I and type II errors; type I error occurs when the model predicts that an issue will be overpriced when it actually is underpriced. Type II error occurs when the model predicts that an issue will be underpriced when it actually is overpriced. Panel C presents the empirical confidence intervals for the coefficients of the in-sample model as given by the bootstrap technique. Finally, panel D presents the evaluation table for the in and out-of-sample as given by the bootstrap results.

Panel A: Logit Model

Variable	Constant	P_{UPDATE}	IPOMKT	STOCK%	SHIP%	EFFIC	GEAR
Coefficient	-14.907***	7.021*	7.546***	38.591***	1.815*	7.354***	6.097**
	(3.234)	(3.60)	(1.638)	(9.606)	(0.991)	(1.791)	(2.636)
Tolerance Statistic		0.758	0.896	0.807	0.815	0.926	0.770
LR Statistic	46.26						
Prob. (LR Stat)	[0.00]						
McFadden R^2	0.656						
H-L Statistic	1.557						
Prob. Chi-sqr.	[0.99]						

Panel B: Expectation-Prediction Evaluation Table

	Number Correct	% Correct	Number Incorrect	Type I/II Error (%)
Underpriced Issues	26	96.30	1	3.70 (Type I Error)
Overpriced Issues	20	83.33	4	16.67 (Type II Error)
Total	46	90.20	5	

Panel C: Bootstrap Check for Robustness / Coefficients

CI %	Constant	P_{UPDATE}	IPOMKT	STOCK%	SHIP%	EFFIC	GEAR
@0.0025	-45.211	3.511	6.279	29.415	0.913	5.196	3.996
@0.5	-15.436	7.082	7.674	38.437	1.824	7.582	6.081
@0.975	-12.857	16.323	36.604	62.246	4.155	13.054	11.167

Panel D: Bootstrap Check for Robustness / Expectation-Prediction Evaluation Table

	Underpriced Issues				Overpriced Issues				
	Number Correct	% Correct	Number Incorrect	Type I Error (%)	Number Correct	% Correct	Number Incorrect	Type II Error (%)	Total Correct %
In-Sample	21.3734	89.70%	2.4404	10.30%	17.7772	83.89%	3.4090	16.11%	87.00%
Out-of-Sample	2.420	77.12%	0.733	-	2.275	80.17%	0.573	-	78.27%

The models' ability to predict the probability of underpricing is examined next. The overall prediction rates of the model are not meaningful without taking into consideration the type I and type II errors[26] (Zavgren, 1983). Table 5.4, panel B, depicts the actual number and percent of issues correctly classified and misclassified by our model given a specified cut-off probability set to 0.48[27]. Our model predicts correctly 26 out of 27 issues (96.30 percent) that have been underpriced, and 20 out of 24 issues (83.33 percent) that have been overpriced. Overall, the estimated model predicts correctly 90.20 percent of the whole sample with type I and type II errors at 3.70 and 16.67 percent respectively.

Although our model predicts correctly 90 percent of the entire sample, one criticism may be the fact that the total number of observations in our sample is small. To further test the robustness of our model, we run additional in and out-of-sample tests using simulation techniques[28]. From the overall sample of 51 issues we select randomly 46 issues and estimate the logit model only on these issues; this sample of 46 issues forms the basis for the simulated in-sample results. The remaining 5 observations are then used to assess how well the model performs on an out-of-sample basis. This process is repeated 5,000 times by selecting a different in-sample each time.

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[26] Type I error occurs when the model predicts that an issue will be overpriced when it actually is underpriced. Type II error occurs when the model predicts that an issue will be underpriced when it actually is overpriced.

[27] Instead of relying on a simple à priori cut-off probability of 0.5, we calculate the optimal cut-off probability according to Palepu (1986). The condition that will allow us to determine the optimal cut-off probability is the following: $\frac{f_1(p|i = undepriced)}{f_2(p|i = overpriced)} \geq 1$

where $f_1(\ )$ is the distribution of underpriced issues and $f_2(\ )$ is the corresponding distribution for overpriced issues. To determine the optimal cut-off probability we first estimate the conditional probability density functions of $f_1(\ )$ and $f_2(\ )$ by plotting the distribution of the estimated probabilities for the underpriced and overpriced issues that are used to estimate the model parameters. The optimal cut-off probability is the value where the two plots intersect.

[28] The bootstrap technique we use in this paper has been used previously in failure prediction studies to validate the results of the models (Grammenos et al., 2008; Charitou et al., 2004; Barniv et al., 2002; Huffman and Ward, 1996).

Table 5.4, panel C, presents the empirical confidence intervals for the coefficients of the in-sample model and it can be seen that the values of the original model, in panel A, are very close to the median of the empirical estimates. Table 5.4, panel D, indicates that the in-sample model –on average –predicts correctly 89.70 percent of the underpriced issues and 83.89 percent of the overpriced issues. Further, the in-sample model correctly predicts 87 percent of the overall observations with low type I and type II errors at 10.30 and 16.11 percent respectively. Turning next to the out-of-sample tests, we observe that the model forecast correctly predicts – on average – 77.12 percent of the underpriced issues and 80.17 percent of the overpriced issues, with an overall prediction rate of 78.27 percent. The bootstrap results further indicate the robustness of our original model in predicting the probability of underpricing a shipping US IPOs.

In order to check how the probability of underpricing responds to changes in the explanatory variables, we transform the estimates of our model into yield estimates of the marginal effects – that is, the change in predicted probability associated with changes in the explanatory variables. The marginal effects are non-linear functions of the parameters' estimates and the levels of the explanatory variables[29] (Anderson and Newell, 2003). Figures 5.3.1 – 5.3.6 illustrate the marginal effects on the probability of undepricing.

[29] For instance, the marginal effect of x_j on the probability of underpricing is given by $\frac{\partial \mathrm{E}(y_i|\chi_i,\beta)}{\partial \chi_{ij}} = f(-\chi_i'\beta)\beta_j$, where $f(\chi) = \partial F(\chi)/\partial \chi$ is the density function corresponding to F. The direction of the effect of a change in x_j depends only on the sign of the β_j coefficient.

Figures 5-3.1 – 5.3.6: Marginal Effects of Variables on the Probability of Underpricing

Figure 5.3.1

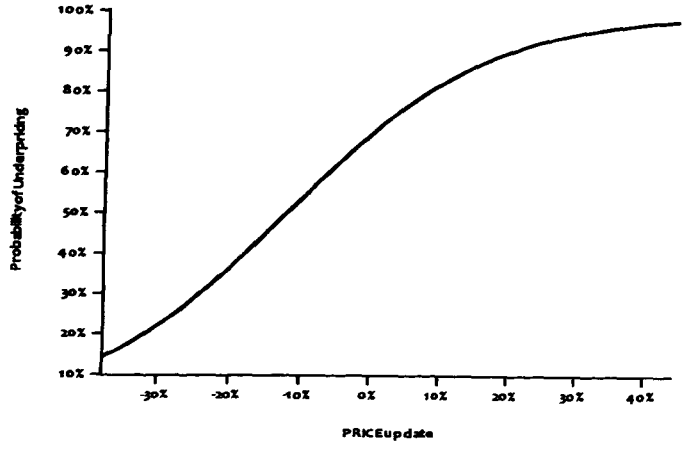


Figure 5.3.2

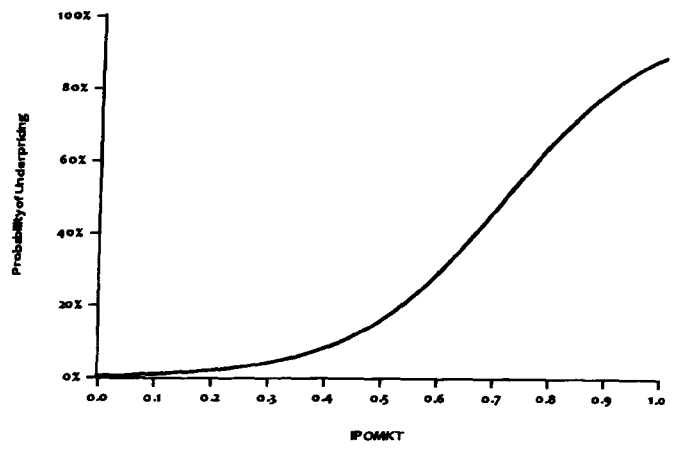


Figure 5.3.3

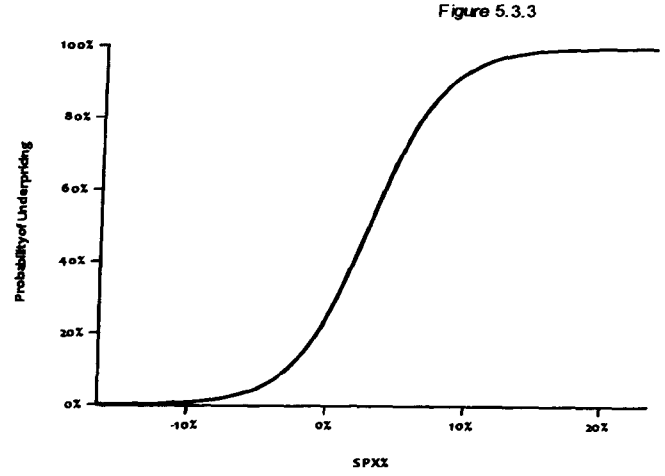


Figure 5.3.4

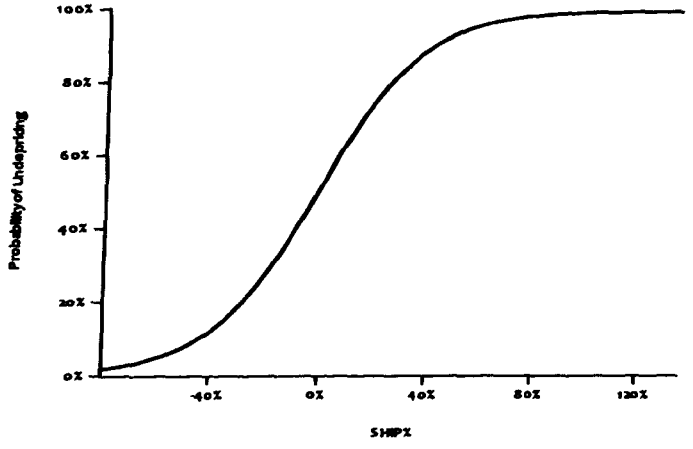


Figure 5.3.5

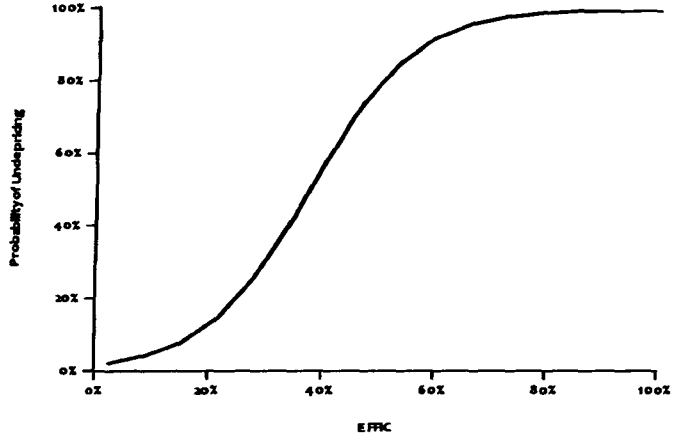
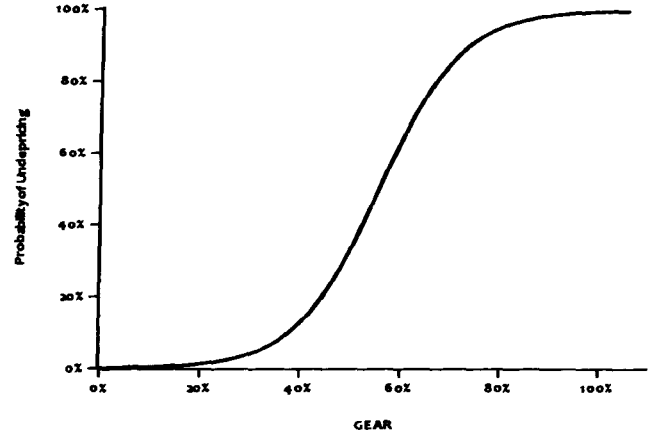


Figure 5.3.6



The marginal effect of P_{UPDATE} is depicted in figure 5.3.1. It is observed that changes of this variable have a positive effect upon the probability of underpricing. For example, consider two shipping companies X and Y that have similar characteristics, in regard to the rest of our models' variables but the P_{UPDATE} variable, and go public at the same time. Next, let us assume that company X has no price revision in its final offer price, whereas company Y has a 10 percent upward price revision. In this case, the probability that the IPO of company Y will be underpriced is 10 percent higher than that of company X.

Turning to figure 5.3.2 for the IPOMKT variable, we can see that when this variable changes from 0 to 1 (1, if the issue takes place during a hot IPO month and, 0 otherwise) the probability of underpricing increases by almost 90 percent. Figure 5.3.3 presents the marginal effects of the SPX% variable on the probability of underpricing. Note that when the stock market sentiment stands at 0 percent and subsequently rises to 5 percent, the probability of undepricing increases by approximately 40 percent. Looking back at table 5.2, it is observed that the average stock market sentiment for the undepriced and overpriced issues is 8.6 percent and 1.7 percent, respectively. Thus, there is no doubt that issues taking place at times when the stock market sentiment is higher (bullish) have higher likelihood of being underpriced. Figure 5.3.4 shows the marginal effect of SHIP% on the likelihood of underpricing. It is observed that, a change in this variable from 0 percent to 20 percent increases the probability of underpricing by almost 30 percent; hence, there is a positive relationship between this variable and the probability of underpricing. In other words, when the shipping market sentiment is more bullish then the probability of an issue being underpriced also increases. This can also be confirmed by looking at table 5.2, where we can see that the mean value for this variable is 25.7 and 1.5 percent for the underpriced and overpriced issues, respectively.

Figure 5.3.5 shows the marginal effects of total assets turnover (EFFIC). When EFFIC changes from 20 to 40 percent it can be seen that the probability of underpricing increases by almost 40 percent; for changes occurring above 70 percent and below 20 percent the marginal effect is close to zero. As a result, positive changes in this variable have positive effects on

the likelihood of undepricing a shipping IPO. Finally, Figure 5.3.6 illustrates the marginal effects of gearing ratio on the probability of underpircing. A change in the ratio from 40 percent to 60 percent increases the probability by almost 35 percent. For changes occurring between 0 to 20 percent and above 80 percent the marginal effect is close to zero. For instance, let us assume that two companies X and Y have identical values regarding our logit model variables, tap the equity capital market at the same time and the only variable which is different between the two companies is the gearing ratio. If company X has a gearing ratio of 60 percent and company Y of 40 percent, then the issue of company X has a probability of being underpriced which is 35 percent higher than the probability of company Y.

5.5) Conclusions

This paper provides tests of the Benveniste and Spindt (1989) partial adjustment theory and Rock's (1986) winner's curse theory for shipping US initial public offerings. In particular, we find evidence consistent with the partial-adjustment phenomenon, where the final offer price update is found to be significant and explains about 20 percent of the first day returns for shipping US IPOs. Additionally, we examine the extent to which first day returns can be explained by using public information available prior to the offering date. The variables employed in our model include the final offer price update, the underwriters' rank, three variables controlling for hot or cold IPO markets, the stock and shipping market sentiments, the current ratio, the return on assets ratio, the total assets turnover ratio, and finally, the gearing ratio. Our results suggest that the above variables explain about 53 percent of the first day returns for shipping IPOs and they clearly provide evidence that the final offer price does not fully reflect many types of public available information. More specifically, it seems that underwriters overvalue the significance of the current ratio and the return on assets ratio. Furthermore, underwriters tend to be conservative when taking into account the market conditions prevailing at the time of the issue and in regards to the total assets turnover and

gearing ratios. Overall, our results support the partial adjustment theory of Benveniste and Spindt (1989) while at the same time reject the winner's curse theory of Rock's (1986).

After finding evidence that there is partial adjustment in the final offer price and that public information may explain the first day returns of shipping US IPOs, we examine whether the probability of underpricing for shipping US IPOs can be predicted. Our logit model, which predicts correctly 90 percent of the entire sample, includes variables easily accessible by all investors and available prior to the IPO. In particular, the market conditions at the time of the issue, the final offer price update, the operating efficiency and the gearing level of the company appear to be statistically significant in predicting the likelihood of shipping IPOs underpricing. The fact that the current ratio and the return-on-assets do not affect the probability of underpricing leads us to the conclusion that investors, when making their investment decisions, prefer to look at the operational efficiency and gearing level of the company rather its liquidity and profitability status.To check the robustness of our model, we perform in and out-of-sample tests which further confirm the reliability of our model. Overall, our logit model suggests that there is no asymmetric information between participants (the issuer, the underwriter, the initial investors, and the secondary market investors) in shipping IPOs and investors can predict the likelihood of underpricing by analysing public information available prior to the first trading day of the IPO.

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