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The Foreign Corrupt Practices Act: Regulatory Burden and Response

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Abstract

The Foreign Corrupt Practices Act (FCPA) of 1977 predates more recent legislation such as Sarbanes-Oxley and the Dodd-Frank Wall Street Reform and Consumer Protection Act. The FCPA had a similar intent--to restore confidence in American business. This paper explores the reaction to the passage of FCPA as well as the long-term effects. The analysis of FCPA shows that the stock market interpreted FCPA as something that would change the way business was done and put American firms at a competitive disadvantage to firms from other countries. But in the long run it appears that the FCPA has not hurt American competitiveness and the FCPA did not change corporate behavior in the quarter century and more after its passage. Initial reactions to legislation from business and the market must be considered carefully. Whether or not regulations change corporate behavior depends critically on continual surveillance with sufficient resources and political willpower.

I. Introduction

In 1977 Congress passed the Foreign Corrupt Practices Act (FCPA). This piece of legislation developed from a string of corporate misdeeds--over 400 U.S. firms had made millions of dollars of bribes. The hope by the writers of the regulation was that FCPA would restore faith in American business. From business point of view, at the time, it was felt to be onerous and would hurt U.S. foreign trade. This paper explores the reaction to the passage of FCPA as well as the long-term effects. The story of FCPA is timely because it has lessons for today's post-financial crisis, post-Enron environment.

Somewhat similar in intent—to restore confidence in U.S. business—are 2002's Sarbanes-Oxley (SOX) and 2010's Dodd-Frank Wall Street Reform and Consumer Protection Act. Dodd-Frank was passed in the wake of the financial crisis that began in 2007, a crisis to some degree blamed on mortgage brokers and commercial and investment banks. A few years earlier, in 2002, Sarbanes-Oxley (SOX) was passed with great fanfare[1] in the wake of a string of corporate scandals, including Enron, WorldCom, Global Crossing, Tyco International, and Qwest Communications. Dodd-Frank is unusual in that so many of the details have been developed slowly since passage and many are still to be determined, so forecasting effects has been difficult. However, the rules that have been floated for comment have drawn many opinions about dire consequences for business and the economy. In the case of SOX there was a general conclusion that there would be significant compliance costs (more so for small firms), the price of increased transparency. There were conflicting conclusions about market reactions, to some degree linked to firm size. Most agree that the costs to smaller firms would likely outweigh the benefits.[2]

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[1] President Bush called SOX the "most far-reaching reforms of American Business practices" since the regulations passed during the 1930s (Hitt, 2002).

[2] Li, Pincus, and Rego, 2006, found the market expected net benefits from SOX, although SOX would impose greater costs on smaller firms and those with less-independent audit committees. Rezaee and Jain (2006) also found a positive stock price reaction to events that increased the likelihood of passage of the act. Chhaochharia and Grinstein (2007) found a generally positive effect on firm value. Interestingly, they found that large firms that need

Our analysis of FCPA, including an event study not previously reported, shows that the stock market interpreted FCPA as something that would change the way business was done and, given the market reaction to the legislation, put American firms at a competitive disadvantage to firms from other countries. But do short-term market reactions correctly forecast long-run outcomes? In the long run it appears that the FCPA has not hurt significantly American competitiveness; in fact there is disagreement about whether it affected competitiveness at all. Most importantly, and unfortunately, it appears that the FCPA did not change corporate behavior in the quarter century and more after its passage. It is not enough for legislation and/or regulation to be well-intentioned or even well-written. There also have to be sufficient resources and willpower to monitor and enforce. The lesson is not surprising but it is worth noting: without enforcement and political support, legislation and regulation may not have the desired effect. Thus, whether or not regulations, in the long run, change corporate behavior probably depends critically on continual surveillance with sufficient resources and political willpower.
This essay is structured as follows: the next section describes the FCPA and the events leading up to it. Section II describes the event study and results. Section III investigates the long-term effects of the legislation and section IV concludes.

I.1 The Foreign Corrupt Practices Act

Bribery in business is common in many countries, and American multinational firms have engaged in this practice. Bribes of government officials are used to address regulatory complications, to obtain government contracts, to receive import licenses. In the early 1970's, two investigations made the American public aware of several instances of bribery. First, in 1970 ITT (International Telephone and Telegraph) offered $1 million to the CIA to block the election of Salvadore Allende in Chile (1973 investigation by the Committee on Foreign Relations, Subcommittee on Multinational Corporations, reported in Church Report, 1975). The CIA did not accept.[3] Later it was alleged that Allende demanded $1 million for protection against appropriation (reported in Cragg and Woof, 2002) from large multinationals. Second, the Watergate investigations revealed additional instances of bribery. Among the most publicized were Lockheed Corporation's payments of over $200 million to foreign officials in many countries, including the Netherlands, Japan, Italy, Germany, Mexico, Spain, and Greece. In the wake of these revelations, the SEC offered immunity from prosecution to firms reporting improper payments, resulting in 400 firms disclosing improper payments totaling over $300

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to make more governance changes had higher excess returns, while small firms had lower returns, echoing the results of Li, Pincus, and Rego. On the other hand, Zhang (2007) and DeFond et al. (2008) provided evidence that both shareholders and bondholders expected the net benefits of SOX to be negative. See Maher and Weiss (2010) for a useful literature review.

[3] This is not to say that the CIA has not been involved in Chilean elections. According to the Church Report (1975) the CIA spent $2.6 million in 1964 to prevent the accession to the presidency of Salvador Allende. And from 1971 through 1973 the U.S. transferred nearly $4 million to opposition political parties in Chile

million.[4] Meanwhile the IRS identified over 270 cases of bribery as a result of interviews (see Hines 1995).[5] Other instances of bribery revealed at this time included Gulf Oil's payments to the Korean government ($1 million in 1966 and $3 million in 1970) and Ashland Oil's payment of $300,000 to the ruling party of Gabon, in Africa.[6]

The U.S. response came in the form of two pieces of legislation. In 1976, at the end of the Ford administration, legislation passed requiring firms to disclose foreign bribe payments, and in December, 1977, at the beginning of the Carter administration, the Foreign Corrupt Practices Act (FCPA) was passed (part of it, the accounting provisions--see below--as an amendment to the Securities Exchange Act of 1934).[7] This legislation was designed to punish and reduce (and hopefully eliminate) bribery of foreign government officials by U.S. firms (including the use of third-party "facilitating agents") and hoped to "restore public confidence in the integrity of the American business system" (U.S. Department of Justice, 1977). These words echo William Proxmire, the bill's sponsor, who said in the report accompanying the bill that bribery "erodes public confidence in the integrity of the free market system" (Committee on Banking, Housing and Urban Affairs, 1976). This aspect is very important; the public included not only the American public, but those overseas as well: bribery "lends credence to the worst suspicions sown by extreme nationalists or Marxists that American businesses operating in their country have a corrupting influence on their political system" (Committee on Banking, Housing and Urban Affairs, 1976).[8]

Specifically, it prohibits payments "to foreign officials for the purpose of obtaining or keeping business." The FCPA addresses the issue in two ways. One, it criminalizes bribery for the purpose of obtaining business and in doing so creates several civil and criminal penalties (fines, injunctions, prison). Firms can face fines up to $1 million; individuals face fines up to $10,000 and prison sentences up to 5 years. Second, it requires that firms with publicly traded stock (referred to as "issuing firms" and including non-U.S. firms with securities issued in the U.S.)

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[4] Interestingly, firms reporting such payments experienced abnormal and negative stock price reaction (Smith, Stettler, and Beedles , 1984).

[5] It was also at this time, although it was not revealed for another decade, that Westinghouse Corporation was paying anywhere from $17 to $50 million to Philippines President Marcos and his cronies in order to win a contract (over General Electric) to construct a nuclear plant in the Philippines. This debacle ended with charges of unsafe construction and the dismantling of the plant after a total cost of $3 billion. The series of events is described in Cragg and Woof (2002).

[6] Ashland was again found to have made improper payments in 1982 in Zimbabwe, after the FCPA was in place. Lockheed Martin also was charged in 1994 with paying $600,000 in bribes to an Egyptian government official. It seems the behavior of these firms did not change.

[7] Note too that the Tax Reform Act of 1976 penalized bribe-paying firms by disallowing bribe payments to be deducted when determining earnings, thus subjecting bribe payments to immediate taxation (as distributed income).

[8] This Report (94-1031) actually accompanied an earlier version of the bill, S. 3664 introduced in 1976. These words are echoed in Report 95-114 that accompanied S. 305 in 1977, the revised bill.

keep detailed books and records that reflect payments and transactions and have sufficient internal controls, thus making it more difficult to hide bribery. Firms are encouraged to develop compliance programs to prevent bribery, to investigate allegations, and to report instances of bribery to the government. (For more on the FCPA and its provisions, go to the U.S. Department of Justice's website: http://www.justice.gov/criminal/fraud/fcpa/)
The law does not forbid payments to low-level foreign government employees "whose duties are essentially ministerial or clerical." That is, payments to secure a permit or to help a shipment through customs–so-called grease payments or facilitation payments--are not forbidden by this law. (Note that in the U.S. itself such payments are illegal.) The FCPA is addressing large payments to high-level officials. It also does not prohibit payments to officers of foreign firms without government ties.

At the time, the U.S. was the only country with legislation like the FCPA outlawing bribery of foreign government officials. Sweden outlawed bribery of foreign officials in 1978; no other country acted until 1997 when thirty-four countries adopted the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions (OECD, 1997). The FCPA was amended in 1988 during the Reagan administration to cover, among other things, foreign firms (in addition to "issuing firms") which act in furtherance of a corrupt payment while in U.S. territory. In some ways, the revision was felt to weaken the law by requiring direct knowledge that payments are used for illicit purposes.
While, at the time of passage and after, the law was criticized for being vague and lacking sufficient direction for firms (e.g., U.S. General Accounting Office, 1981), we do have a somewhat "objective" evaluation of the legislation that concludes it is effective. The OECD issued a Phase 1 report in 1999 on the U.S. legislation (the FCPA) which implements the OECD Convention on Combating Bribery. The report says: "Generally, the FCPA implements the standards set by the Convention in a detailed and comprehensive manner. The formulation of the statute is structured and practical in its scope and applicability" (OECD 1999).
On-the-surface outlawing bribery seems like a good policy, and it may be, but it is also important to note that there is an inherent problem with outlawing behaviors like bribery. While all cultures may forbid corruption, they may differ on what defines corruption. What we define as bribery may not be seen as corruption in another culture. For example, it may be seen as good etiquette, a giving of a gift. For more on the cultural aspects, see Dalton (2006).[9]

II. The Market Reaction

The introduction of a law limiting bribe payments, if effective, would have a number of costs and benefits. The reaction of the market (that is, stock price increases or decreases above or below the market's increase or decrease as a whole) to this event provides an estimate about whether costs or benefits are expected to dominate now and in the future. (The value of a stock should be

[9] Dalton does not advocate having no limits on payments to foreign officials. Rather she advocates some realistic amount below which payments could be considered gifts as part of the cultural norm of the society.

based on future cash flows available to the equity holders.)
The benefit of reducing bribery is straightforward. Bribery is costly, and firm value should be increased if bribery is reduced, all else equal. There is another clear benefit if all bribery (not just U.S. firm bribery) is reduced. Bribery is bad for the economic health of countries (e.g., Mauro 1995). The economic health of a country, in turn, affects long-run profitability and thus reducing bribery increases firm value.
The primary argument that FCPA would hurt U.S. firms is the comparative disadvantage argument. The competing non-U.S. firms will have an unfair advantage because they can pay bribes and U.S. firms cannot. If FCPA reduces bribery, then American firms will lose business and firm value is reduced. This may be true if bribery is an effective way to get business. It can be argued that bribes are an ineffective way to get business because agents or employees fail to pass the payments on or the contract may have been won anyway. The second major argument that the FCPA will reduce firm value is that adherence to the law is costly. Training, reporting requirements, and new or improved control systems require costly firm resources.

On balance, the net effect of FCPA on firm value is an empirical issue. We examine a sample of 178 multi-national firms to find out the stock market's assessment of FCPA's impact on firm value. The appendix provides a list of companies in the sample. The initial list of multinationals was obtained from the World Directory of Multinational Enterprises (Stopford, 1983) and from CRSP (Chicago Research in Security Prices) database. The firms in the sample were chosen based on the availability of firm level data in the event study period: January 31, 1977 to December 31, 1979. The analysis was done using event study software by EVENTUS.

We assume the daily return on a firm's stock takes the form:
$R_{it} = \alpha + \beta R_{mt} + \varepsilon_{it}$
where R_{mt} is the daily return on a value-weighted portfolio of all NYSE, AMEX, and NASDAQ listed stocks and ε_{it} is a normally distributed error term. The model's parameters ($\hat{\alpha}$ and $\hat{\beta}$) are estimated using returns for 180 days prior to the event window. Within the event window (defined variously below) the abnormal return of firm i on day t is:

$$AR_{it} = R_{it} - \hat{\alpha}_i - \hat{\beta}_i R_{mt}$$

And the cumulative abnormal return for period t – j to t (or s to t) is:

$$CAR_{i,t-j,t} = \sum_{s=t-j}^{t} AR_{is}$$

The mean CAR is then just the average over all n firms. (See MacKinlay 1997 for an overview of event study methodology.)
Because the incidence of bribe-taking and in fact the opportunities for bribe-making vary across countries and industries, we would expect the effect of the FCPA would vary across countries. However, large multinationals operate in many countries. If the aggregate market feels that the introduction of FCPA would hurt these firms, we would expect that the value of these firms' stock would decline as the market impounds reduced future revenues and profits.

The FCPA was passed into law on December 12, 1977, but the market was aware of FCPA several months prior to passage.[10] Therefore, we examine market reaction over several windows. To examine market reaction leading up to passage, we examine varied windows from six months prior to 30 days prior to passage. Similarly, we examine several windows subsequent to passage ranging from one-month to six-months. See Table of Results.

Table about here

We find that the market reacted negatively in the time period prior to passage of FCPA. Subsequent to passage of FCPA, the market reaction was essentially zero. In particular, the six-month pre-passage window shows a -4.27% reaction significant at 1% level. Post passage reaction over a six-month window is -1.49% but is not statistically significant. The event study results suggest the market anticipated net costs to multinational firms due to the legislation, and this reaction was fully impounded upon passage of the bill.[11]

III. Long-run effects on competitiveness and behavior

The negative market reaction suggests that the FCPA would be costly. Certainly firms felt that there would be substantial costs to compliance–such as expanded internal documentation efforts and training. But many of these costs are one-time (e.g., revising a code of conduct) or relatively low-cost.[12] In the long run, the most likely explanation for a negative reaction is that the new legislation would hurt U.S. firms' ability to compete overseas (the comparative disadvantage argument). By extension, it would also suggest that behavior would change. In reality, it is not clear that either of these things happened.

A. Competitiveness

The effects on competitiveness are not clear-cut. Executives polled shortly after the law was passed reported losing business or expected to lose business, citing the competitive disadvantage argument (see for examples, Kim 1981, U.S. General Accounting Office 1981, and the survey by the Department of Commerce reported in Graham, 1984). For example, in Kim's survey, 83% of his Fortune 500 executives polled felt the "Act placed US multinational corporations at a competitive disadvantage." 26% felt their firms had lost a "substantial" amount of foreign sales

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[10] In 1976 and 1977 Congress held hearings and considered legislation, but the Ford administration did not back the legislation in 1976. It was in 1977 the Carter administration pushed the legislation.

[11] Foreign exchange effects during this period are minimal. For example, the trade weighted exchange index of the dollar versus a broad group of major U.S. trading partners (Board of Governors of the Federal Reserve System Release G.5) was 36.78 on 1-1-1977, 36.77 on 7-1-1977, and 35.94 on 1-1-1978. All else equal, the small depreciation in 1977 might be expected to slightly hurt imports into the U.S., but would help exports from the U.S. Beck, Maher, and Tschoegl (1991) examined "The Impact of the Foreign Corrupt Practices Act on U.S. Exports" and included a foreign exchange variable. This variable is insignificant with a coefficient virtually zero.

[12] This may be arguable. In the 1981 Comptroller General report (U.S. General Accounting Office 1981), 50% of the respondents claimed that compliance had "significant costs," 50% felt their accounting and auditing costs had increased by 11 to 35% and another 22% felt those costs had increased over 35%. On the other hand, in a 1995 study, only 36% of NYSE firms sampled had an anti-bribery provision in their code of conduct (Spaulding and Reinstein, 1995).

as a result of the Act. In the GAO survey, only 0.6% felt they had suffered a "great decrease in business" while 12% thought the decrease was moderate and 19.6% thought there was "somewhat of a decrease."

Hines (1995) finds that U.S. business activity was "significantly reduced" in countries in which government officials routinely receive bribes. This effect was measured by foreign direct investment (controlling for GDP growth and FDI from other countries), capital/labor ratios, joint venture activity, and aircraft exports (a particularly high-bribery industry). "Business in corrupt countries fell by amounts that are associated with 30% reductions in local GDP." Beck, Maher, and Tschoegl (1991) found that the FCPA did not have negative effects on exports to bribery-prone Latin American countries, where the U.S. has a regional advantage (cost advantages and a dominant market position), but did affect negatively U.S. exports elsewhere where U.S. firms faced more even competition.

However, others find that the FCPA has not reduced business activity (e.g., Graham 1984, who compared U.S. share of trade across countries; and Cragg and Woof, 2002). Some step back, take a broad macro view, and ask "how bad could we have been hurt?" For example, between 1977 and 2005, the U.S. share of world merchandise trade (imports plus exports) hardly moved from 12.3% to 12.4% while increasing (in nominal terms) at 8.3% per year (World Trade Organization, 2006). If we add in commercial services, the U.S. share of imports plus exports (between 1980 and 2005) modestly increased from 11.3% to 12.6% with an annualized growth rate of 7.4% (these data echo but update Darrough, 2004). Geo-Jaja and Mangum (1999) point out that from 1986 to 1996 U.S. trade with "'bribe-prone' countries actually had outpaced trade with non-'bribe-prone' countries." The authors conclude that U.S. firms have adhered to the FCPA and "have not suffered competitively for that adherence."

Despite this growth in foreign trade, certainly there are cases of lost business due to bribery (or lack of it). For example, in the seven years from 1994 through 2000, the U.S. State Department received allegations that bribes had been offered in some 414 international contracts worth about $202 billion. In deals where there were bribery allegations and known outcomes, American firms lost 101 contracts worth approximately $30 billion (totals aggregated from various Reports by U.S. Department of State on Battling International Bribery, 1999, 2000, 2001). Of course, it is not known how many of these contracts the U.S. firms may have received or at what cost, if they had bribed, but we assume it is some portion of the $30 billion.

The various studies seem to suggest that U.S. firms likely faced some reduction in business activity, but in the aggregate, not a crippling reduction. And to the extent that the business U.S. firms did conduct was without bribery, profitability may have increased. In the large scheme of things, the FCPA seems a modest burden at worst. The effects of export controls due to national security or foreign policy reasons (e.g. sanctions) dwarf the effects due to FCPA. David Richardson writes, "Across-the-board regulatory burdens, such as procedures mandated for all businesses by the Foreign Corrupt Practices Act, seemed generally unimportant" (Richardson, 1993).

B. Behavior

The real hope, of course, is that the corrupt behaviors the FCPA prohibits would be reduced in actuality. After all, one of the stated goals was to "restore public confidence in the integrity of

the American business system." Of course, separating actual behavior from intended behavior is difficult without publically available data.[13] One measure is the "Bribe Payers Index" from Transparency International. According to Transparency International, the index attempts to "measure the supply side of bribery: the relative propensity to pay bribes by companies from leading exporting states in emerging economies" (Transparency International, 1999). The index is created from the results of interviews or questionnaires with private sector leaders potentially involved with bribery and the four most recent reports were published in 1999, 2002, 2006, and 2008. The basis of the report were 779 interviews in 14 countries in 1999, 835 interviews in 15 emerging market countries in 2002, 11,232 respondents in 125 countries in 2006 (interviews were replaced by questions in World Economic Forum's Executive Opinion Survey 2006), and 2742 respondents in 2008 from 26 countries.

1999 was the year the OECD AntiBribery Convention was implemented. In 1999 the U.S. ranked ninth among leading exporters, with an index of 6.2 (out of a possible 10). For perspective, Sweden was ranked highest (lowest propensity to bribe) with a score of 8.3. The U.S. was tied with Germany, a country where at that time bribes were considered a legitimate and deductible business expense (Cragg and Woof, 2002). Ranking below the U.S. (in descending order) were Singapore, Spain, France, Japan, Malaysia, Italy, Taiwan, South Korea, and China. Recall that only the U.S. had an anti-bribery policy prior to the OECD AntiBribery Convention of 1999. Thus the fact that eight countries rank higher than the U.S. indicates that the U.S. law has not been overwhelmingly successful at changing actual behavior.

In the 2002 Bribe-Payers Survey, the U.S. now has a score of 5.3, placing it at 13th, tied with Japan and below Singapore, Germany, and France–all countries that ranked below the U.S. three years earlier. Russia, new to the list, replaces China at the bottom while Australia just outscores Sweden and Switzerland for least bribes paid. In 2006 the U.S. was again tied for ninth, along with Belgium, with a score of 7.22. Switzerland is ranked the best and India the worst. In 2008 the U.S. was again in ninth (tied with Singapore and France), with a score of 8.1. Belgium and Canada are ranked the best and Russia the worst.

The ranking of the U.S., especially in 1999, is disturbing. Given that the U.S. was the only country with an anti-bribery law from 1977 to 1999, we might have expected that the U.S. would place higher in the 1999 survey. In the three years that follow, the U.S. declined in performance both comparatively and by the scale score, although it rebounded in the four years following. The results suggest (although do not prove) that the FCPA had not been effective in changing corporate behavior (although the broad adoption of the OECD AntiBribery Convention may have influenced behavior after 1999).

More evidence comes from the World Bank (Hellman, et al, 2000, reported in Krever, 2007): "foreign direct investment (FDI) originating in the U.S. is not characterized by 'higher standards of corporate ethics than domestic firms or FDI originating in other countries.' Indeed, a higher percentage of U.S. firms pay public procurement kickbacks (over 40%) in the countries analyzed

[13] Note that a recommendation from the OECD (under a Phase 2 evaluation of the U.S.) was that the U.S. develop and maintain statistics on allegations of violations of FCPA. The U.S. responded that it does maintain a non-public database (United States, Follow-up Report on the Implementation of the Phase 2 Recommendations, 2005).

than do firms based in France, Japan, Germany and the U.K."
One reason there was not a greater change in behavior may be the attitude or behavior of the U.S. government itself, perhaps indicative of the political will necessary for real change. Transparency International asked an additional question in 2002 about which government is associated with using other "unfair" means to gain an advantage for its firms (e.g., political pressure, financial pressure, tying to foreign aid, and so on). 58% of the respondents believe the U.S. government does such things, versus only 26% for the second highest country (France). In fact, the U.S. government, during the Iran-Contra affair of the Reagan administration, "violated many of the principles of the Foreign Corrupt Practices Act by conducting overseas business transactions facilitated by bribery and then falsifying the accounting transactions and destroying records to prevent appropriate disclosure" (Cragg and Woof, 2002, p. 119).
Yet another reason may be a lack of awareness by executives. In 2008 Transparency International found "little awareness of the [OECD anti-bribery] convention among the senior business executives interviewed in the Bribe Payers Survey" (three-quarters of the executives responding were not at all familiar with the convention). The least familiarity was by "respondents from Western Europe and the United States." (However, since the U.S. has its own FCPA, the executives may well be aware of that regulation.) Transparency International goes on to say that "Governments have a key role to play in ensuring that foreign bribery is stopped at the source – and by making good on commitments to prevent and prosecute such practices."
Certainly in the U.S. enforcement of the Act was minimal till about 2002 when it increased in the wake of scandals such as Enron (Searcey, 2009). For example, in the first 20 years of the FCPA (1977-1997), the SEC brought forward only three cases. The Department of Justice brought only 30 cases forward (The Short Arm of the Law, 2002). Together that is 1.65 cases per year. There were no cases brought against foreign nationals till 1998. Between 1998 and 2000 the average was 2 per year. During the Reagan administration, the funding for both the SEC and the Department of Justice was significantly reduced and, according to Cragg and Woof (2002) "very few prosecutors in the Justice Department fraud section were authorized to conduct FCPA cases."
The pace of actions picked up in the first half of the 2000s--averaging 6.3 from 2002 to 2004, then 13 each for 2005 and 2006, followed by a relatively staggering 38 in 2007, 25 in 2008, and 47 in both 2009 and 2010 (Urofsky and Newcomb, 2009 and 2011). These increased number of actions reflect increased resources allocated to FCPA investigations, including specialized FCPA units in the FBI (created 2008), Department of Justice (2006), and the SEC (2010) (OECD 2010, Steps Taken).[14] However, "[i]n many cases, the government charged several affiliated companies in a single action and in others both the DOJ and the SEC charged the same company. If we count such matters as single consolidated cases, then the total number of corporate cases for 2010 was 20" (Urofsky and Newcomb 2011). (For a list through 2002 of criminal prosecutions, civil actions, and SEC actions, see Annex to OECD 2002. For descriptions of

[14] There are clearly a number of reasons for increased U.S. actions in addition to business scandals: the OECD Convention (1999), SOX (2002), and more recently in 2009 a renewed commitment by OECD Anti-Bribery signees to step up the fight against corruption and bribery (see OECD 2009a and OECD 2009b).

actions after 2002, see OECD 2010). Similarly, as FCPA actions have increased, so have the fines levied (at least in the larger instances of bribery (penalties were $800 million for Siemens (2008)[15] and $579 million for Halliburton/KBR (2009)) (Urofsky and Newcomb 2009).
If the number of cases, especially early on, seems small, the range of cases is more admirable. As the OECD Phase 2 Evaluation Report of the U.S. states:

> The enforcement history demonstrates a willingness to prosecute large and medium-sized companies, and often high-level officers of those companies, alleged to have been involved in violations of the FCPA throughout the world. Those cases have arisen out of activities in over twenty different countries such as Argentina, Brazil, Canada, Colombia, the Cook Islands, Costa Rica, the Dominican Republic, Egypt, Germany, Haiti, Iraq, Israel, Italy, Jamaica, Mexico, Niger, Nigeria, Panama, Russia, Saudi Arabia, Trinidad and Tobago, and Venezuela. The illegal payments alleged have ranged from US$ 22,000 to US$ 10 million. These illegal payments represent varying percentages of up to 40 per cent of the business obtained. In most if not all prosecuted cases, the payments have taken the form of money, most often paid into third-country bank accounts. (OECD 2002)

Firms and high-level employees prosecuted include major firms like General Electric, Goodyear, IBM and Lockheed Corporation (OECD 2002). However, the report indicated a problem with enforcing the FCPA with small and medium sized businesses.
The evidence suggests that even while the stock market expected negative effects from the introduction of the FCPA, the actual outcomes were very different. Business was virtually unaffected and behavior was unchanged. The dramatic increase in enforcement over the last five years represents a shift in attitude by the government and may yet affect behavior.

IV. Conclusion

The purpose of this paper has been to analyze the U.S. experience with the Foreign Corrupt Practices Act, a landmark piece of legislation intended to restore public confidence in American business. The discussion is timely because more recently two pieces of significant legislation– the Dodd-Frank Wall Street Reform and Consumer Protection Act as well as Sarbanes-Oxley-- were passed, also intended to restore confidence in American business. Interestingly, SOX has been instrumental in increasing compliance with FCPA and in prosecuting violations. That is because "a bribe payment, as described by FCPA, also represents a breach of a company's controls over unauthorized payments" (Katz, 2005), thus a violation of SOX.[16] CEOs and CFOs, who sign off on a company's financials under Sarbanes-Oxley, are wary about not complying with FCPA or disclosing a bribe.
The market reaction to the passage of the FCPA clearly indicates an expectation that the costs of

[15] This was the largest penalty till this time and it was against a non-US firm which traded shares in the U.S.

[16] Apparently the increase in reported bribes began slightly before SOX, with the settlement of the Seaboard case with the SEC, which encouraged and promoted self-reporting by firms in exchange for lenient punishment (Katz, 2005). Also, The Public Company Accounting Oversight Board's Audit Standard 2, which says that a firm's controls must provide reasonable assurance that payments are authorized by management, has been a factor.

the law outweigh the benefits for U.S. multinationals. Presumably, the market expected a significant reduction in overseas business and cash flow due to the restrictions of the FCPA. This would imply that firm behavior regarding bribery would change, that the FCPA would actually reduce bribery from U.S. firms.

However, the results hardly provide strong support to this supposition. The competitiveness of U.S. firms may have been affected, but only modestly if at all. Overall, the position of U.S. firms in the global market remained quite strong during the period between the passage of the FCPA and the introduction of the OECD Anti-Bribery convention. Unfortunately, behavior of the U.S. multinational firms may not have changed significantly. The Bribe Payers Index from Transparency International does not indicate that U.S. firms behaved better than firms from other countries without such a regulation at that time. In fact, it appears that U.S. firms did not improve over time at all.

The law appears to be designed adequately (OECD 1999). However, there appears to have been insufficient will and resources to enforce the legislation. The lesson for American business in a post-Sarbanes-Oxley, post financial crisis world is that there will be no real change in behavior, and thus no restoration of confidence in American business, if the law is not enforced and sufficient resources allocated.

Table of Results

Days	N	Mean Cumulative Abnormal Return	Precision Weighted CAAR	Patell Z	Cross-Sectional Standard Error t
(-179,+1)	178	-4.27%	-3.83%	-3.001**	-2.981**
(-150,+1)	178	-4.88%	-4.27%	-3.654***	-3.301***
(-120,+1)	178	-3.46%	-3.02%	-2.885**	-2.808**
(-90,+1)	178	-1.71%	-1.71%	-1.878*	-1.826*
(-60,+1)	178	-0.62%	-0.71%	-0.952	-0.906
(-30,+1)	178	-0.77%	-0.89%	-1.656*	-1.691*
(+1,+179)	178	-1.49%	-1.90%	-1.509$	-0.964
(+1,+150)	178	-0.70%	-1.03%	-0.896	-0.509
(+1,+120)	178	0.37%	-0.09%	-0.104	0.342
(+1,+90)	178	-0.46%	-0.53%	-0.604	-0.574
(+1,+60)	178	-0.90%	-1.01%	-1.373$	-1.392$
(+1,+30)	178	0.03%	-0.06%	-0.122	0.063

Results of regressing daily returns of 178 multinational firms on the market proxy using value-weighted returns on NYSE, AMEX and NASDAQ. The event day (t = 0) is December 12, 1977, the day FCPA was passed.

$, *, **, *** indicates significance at 10%, 5%, 1%, and 0.1% levels, respectively, for one-tailed tests. Patell Z test statistic and Cross-Sectional Standard Error 't' measure significance level of the test.

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PERM NO	Name on Event Date	PERM NO	Name on Event Date	PERM NO	Name on Event Date	PERM NO	Name on Event Date
15763	A M F INC	20204	CRANE CO	12503	INTERNATIONAL HARVESTER CO	14090	R C A CORP
20482	ABBOTT LABS	17726	CROWN CORK & SEAL INC	12511	INTERNATIONAL MINERALS & CHEM CO	28353	RALSTON PURINA CO
28222	AIR PRODUCTS & CHEMICALS INC	17128	CROWN ZELLERBACH CORP	21573	INTERNATIONAL PAPER CO	24942	RAYTHEON CO
10145	ALLIED CHEMICAL CORP	41080	CUMMINS ENGINE INC	12570	INTERNATIONAL TEL & TELEG CORP	25988	REVLON INC
10153	ALLIS CHALMERS CORP	19406	DART INDUSTRIES INC	16707	JOHNS MANVILLE CORP	18921	REYNOLDS METALS CO
24643	ALUMINUM COMPANY AMER	19350	DEERE & CO	22111	JOHNSON & JOHNSON	14218	REYNOLDS R J INDUSTRIES
10161	AMAX INC	16029	DIAMOND INTERNATIONAL CORP	24635	KAISER ALUMINUM & CHEMICAL CORP	18948	ROCKWELL INTERNATIONAL
28484	AMERADA HESS CORP	24715	DIAMOND SHAMROCK CORP	26825	KELLOGG CO	20474	S C M CORP
10225	AMERICAN BRANDS INC	43916	DIGITAL EQUIPMENT CORP	12706	KENNECOTT COPPER CORP	25013	SCHERING PLOUGH CORP
10241	AMERICAN CAN CO	20626	DOW CHEMICAL CO	25769	KERR MCGEE CORP	36468	SHERWIN WILLIAMS CO
15667	AMERICAN HOME PRODUCTS	19254	DRESSER INDUSTRIES INC	33363	KIDDE WALTER & CO INC	36505	SIGNAL COMPANIES INC
10321	AMERICAN MOTORS CORP	11703	DU PONT E I DE NEMOURS & CO	17750	KIMBERLY CLARK CORP	27473	SINGER CO
10372	AMERICAN STANDARD INC	11754	EASTMAN KODAK CO	12730	KRAFT INC	26390	SMITHKLINE CORP
10516	ARCHER DANIELS MIDLAND CO	11762	EATON CORP	26489	LEAR SIEGLER INC	14525	SPERRY RAND CORP
19692	ARMSTRONG CORK CO	22103	EMERSON ELECTRIC CO	52564	LEVI STRAUSS & CO	45604	SQUIBB CORP
10604	ATLANTIC RICHFIELD CO	58843	EMHART CORP VA	50876	LILLY ELI & CO	23325	ST REGIS PAPER CO
40416	AVON PRODUCTS INC	19713	ESMARK INC	12888	LONE STAR INDUSTRIES INC	14533	STANDARD BRANDS INC
27887	BAXTER TRAVENOL LABS INC	42550	ETHYL CORP	27086	M C A INC	14541	STANDARD OIL CO, CAL
17953	BEATRICE FOODS CO	11850	EXXON CORP	13047	MARATHON OIL CO	19553	STANDARD OIL CO IND
10751	BENDIX CORP	19166	F M C CORP	51799	MAYER OSCAR & CO INC DE	25216	STAUFFER CHEMICAL CO
17590	BORG WARNER CORP	18569	FIRESTONE TIRE & RUBBER CO	20263	MCGRAW EDISON CO	14592	STERLING DRUG INC
19393	BRISTOL MYERS CO	25785	FORD MOTOR CO DEL	22752	MERCK & CO INC	14656	SUN INC
10874	BRUNSWICK CORP	21522	FRUEHAUF CORP	15966	MOBIL CORP	24037	SUNBEAM CORP DE
20677	BURLINGTON INDUSTRIES INC	41953	G A F CORP	18382	MONSANTO CO	26542	TENNECO INC
10890	BURROUGHS CORP	12060	GENERAL ELECTRIC CO	22779	MOTOROLA INC	14736	TEXACO INC
20730	C B S INC	16109	GENERAL FOODS CORP	28345	MURPHY OIL CORP	15579	TEXAS INSTRUMENTS INC
10989	C P C INTERNATIONAL INC	17144	GENERAL MILLS INC	19537	N C R CORP	23579	TEXTRON INC

25320	CAMPBELL SOUP CO	12079	GENERAL MOTORS CORP	13311	NABISCO INC	40483	TIME INC
30365	CARNATION COMPANY	12095	GENERAL SIGNAL CORP	16803	NATIONAL CAN CORP	14795	TIMKEN COMPANY
40707	CASTLE & COOKE INC	19414	GETTY OIL CO	13354	NATIONAL DISTILLERS & CHEM CORP	15659	UNION CARBIDE CORP
18542	CATERPILLAR TRACTOR INC	16424	GILLETTE CO	46447	NORTON SIMON INC	14891	UNION OIL CO CALIF
19027	CELANESE CORP	12140	GOODRICH B F CO	34833	OCCIDENTAL PETROLEUM CORP	14912	UNIROYAL INC
27158	CENTRAL SOYA INC	16432	GOODYEAR TIRE & RUBR CO	13610	OLIN CORP	14955	UNITED BRANDS CO
21397	CHAMPION INTERNATIONAL	22568	GOULD INC	13661	OWENS ILLINOIS INC	19131	UNITED STATES GYPSUM CO
11260	CHRYSLER CORP	25005	GRACE W R & CO	13661	OWENS ILLINOIS INC	17830	UNITED TECHNOLOGIES CORP
24571	CITIES SERVICE CO	32475	GULF & WESTERN INDS INC	22509	P P G INDUSTRIES INC	26681	UPJOHN CO
18446	CLARK EQUIPMENT CO	21768	GULF OIL CORP	60506	PACCAR INC	38551	WARNER COMMUNICATIONS
11308	COCA COLA CO	23077	HEINZ H J CO	13856	PEPSICO INC	24678	WARNER LAMBERT CO
18729	COLGATE PALMOLIVE CO	18016	HERCULES INC	21936	PFIZER INC	15368	WESTINGHOUSE ELECTRIC
11332	COLT INDUSTRIES INC DE	38324	HEUBLEIN INC	13901	PHILIP MORRIS INC	39917	WEYERHAEUSER CO
18999	COMBUSTION ENGINEERING INC	27828	HEWLETT PACKARD CO	13928	PHILLIPS PETROLEUM CO	16088	WHITE CONSOLIDATED INDS
11447	CONTINENTAL GROUP INC	18374	HONEYWELL INC	16360	PILLSBURY COMPANY	19334	WHITE MOTOR CORP
11471	CONTINENTAL OIL CO	38973	I C INDUSTRIES INC	26438	POLAROID CORP	27983	XEROX CORP
38914	CONTROL DATA CORP DE	12431	INGERSOLL RAND CO	18163	PROCTER & GAMBLE CO		
22293	CORNING GLASS WORKS	12490	INTERNATIONAL BUS MACHS	24539	QUAKER OATS CO		

Appendix: Sample Firms

The following 178 companies were in the sample on 12/20/1977. PERMNO is the firm identification number on the CRSP (Center for Research in Securities Prices) data set.

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Earnings Quality of the Qatar Exchange and the U.S. Stock Exchange: Empirical Evidence

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Abstract

This study investigates the residuals of discretionary accruals of listed firms in the Qatar Exchange and the U.S. stock market for the period 2004-2009. Our findings show that discretionary accruals of listed firms from the Qatar Exchange are significantly greater than those from the U. S. stock market. Qatar has proven its reserves of natural gas to be about 14% of the world total and third largest in the world. And about 20% of the Qatar Exchange is owned by NYSE Euronext. From the empirical results by three different accrual models, we find that Qatari firms in three industries (service, manufacturing and insurance) tend to manage earnings positively compared with those in the U.S. stock market. Our findings suggest that IFRS adoption and FIFO inventory method under inflationary environment by the Qatari firms resulted in greater residuals from all three accrual models than the U.S. stock market listed firms.

I. Introduction

The Qatar Exchange is the principal stock market of Qatar. Founded in 1997, about 20% of the Qatar Exchange is owned by NYSE Euronext. As one of the fastest growing economies in the world, the Qatar Exchange currently has a total of 44 listed companies that prepare financial statements in accordance with IFRS**.** This study examines the quality of earnings for the listed firms of the Qatar Exchange to provide policy implications in terms of financial reporting as well as monitoring of security market. By using three different discretionary accrual models, we estimate the residuals which actually represent the measurement of how far the reported earnings are from the operating cash flows of the firms. By comparing the magnitude of residuals of listed firms in the Qatar Exchange with those in the U.S. stock market, we find that the Qatari firms in three industries (service, manufacturing and insurance) tend to manage earnings positively compared with those in the U.S. stock market.

The remainder of this study contains the following: Section II consists of motivation and related literature review; Section III describes the sample selection process and research design; Section IV presents the results; Section V offers a summary and conclusions.

II. Motivation and Related Literature Review

II. 1 Earnings Quality and Accrual Models

A major line of the earnings quality and earnings management literature examines managers' use of discretionary accruals to change reported income. Such an examination entails specification of a model to estimate discretionary accruals. The models range from a simple, where total accruals are used as a measure of discretionary accruals to the relatively sophisticated regression models, which breakdown accruals into discretionary and nondiscretionary components. Jones, Krishnan and Melendrez (2008) provide empirical evidence to those who employ extant discretionary accruals models to study earnings management as well as to those who interpret studies that employs those models about the ability of the commonly used models to detect extreme cases of earnings management.

Jeanjean and Stolowy (2008) also find that management incentives and national institutional factors play an important role on earnings management. On the other hand, Dechow, Sloan, and Sweeney (1995) evaluated the relative performance of discretionary accruals models in detecting earnings management by comparing the specification and power of commonly used tests across discretionary accruals. They showed that the modified Jones model provides the most powerful test of earnings management. In this study, we used following three discretionary accruals models - Jones model, modified Jones model, and alternative accrual model – to estimate the residuals of discretionary accruals of listed firms in the Qatar Exchange and the U.S. stock market for the period 2004-2009.

II.2. Adoption of IFRS and Inventory Method

In Qatar, all listed companies should be registered as a limited liability company. Such financial statements should be prepared in accordance with IFRS as published by the IASB. On the other hand, in the U.S., IFRS ruling is not permitted for the listed companies. If the Securities and Exchange Commission (hereafter SEC) decides to incorporate IFRS, reporting under IFRS could start as early as 2015 or 2016. Companies using standards other than U.S. GAAP or IFRS as issued by the IASB must reconcile back to U.S. GAAP. Currently, there are a limited number of situations where financial accounting directly impacts tax, e.g. the LIFO inventory method and the recognition of advance payments. Adoption of IFRS could impact the cash tax position of a company depending on the accounting methods adopted and elections made under the tax law (see PricewaterhouseCoopers LLP 2011). Therefore, IFRS adoption and FIFO inventory method under inflationary environment by the Qatari firms may result in greater residuals of discretionary accruals than the U.S. stock market listed firms.

The foregoing discussion suggests that organized stock markets in the U. S. are relatively well established with larger number of shareholders and prospective shareholders compared with the Qatar Exchange. Therefore, our hypothesis, stated in the alternative, is as follows:

Ha: Residuals from the discretionary accrual models for the Qatari firms are greater than those for the U.S. stock market listed firms.

III. Data and Research Design

III.1. Sample Selection

Table 1 provides sample selection process of the full sample. After excluding banking industry and deleting firms with missing data, our initial sample from the Qatar Exchange and the U.S. Stock Exchange consists of 34 firms and 193 firms, respectively. That is, 115 firm-years data (Panel A) and 936 firm-years data (Panel B) are retrieved from the period 2004-2009.

Table 1, Panel C shows that our samples are mainly from service industries, 22 firms (64.71%) from the Qatar Exchange and 133 firms (68.91%) from the U.S. Stock Exchange. Table 2 presents inflationary environment of Qatar for the period 2003-2010. Since adoption of IFRS by the Qatari firms lead only to FIFO inventory cost method under inflationary

environment, it results in higher net income relative to the U.S. firms within the same industries.

III.2. Model

For those years identified, we run the following three cross-sectional models of discretionary accruals.

Jones Model:

$$TA_{i,t}/A_{i,t-1} = \beta_0 + \beta_1 \cdot (1/A_{i,t-1}) + \beta_2 \cdot (\Delta REV_{i,t}/ A_{i,t-1}) + \beta_3 \cdot (PPE_{i,t}/ A_{i,t-1}) + e_{i,t}$$

Modified Jones Model:

$$TA_{i,t}/A_{i,t-1} = \beta_0 + \beta_1 \cdot (1/A_{i,t-1}) + \beta_2 \cdot ((\Delta REV_{i,t} - \Delta AR_{i,t})/ A_{i,t-1}) + \beta_3 \cdot (PPE_{i,t}/ A_{i,t-1}) + e_{i,t}$$

Alternative Accrual Model

$$TA_{i,t}/A_{i,t-1} = \beta_0 + \beta_1 \cdot (1/A_{i,t-1}) + \beta_2 \cdot ((\Delta REV_t / A_{i,t-1}) + \beta_3 \cdot (PPE_{i,t}/ A_{i,t-1}) + \beta_4 \cdot (CFO_t/ A_{i,t-1} + \square_{i,t}$$

Where, for fiscal year t and firm i, TA is total accruals defined as

$TA_{i,t}$ = earnings before extraordinary items minus operating cash flows;

$A_{i,t-1}$ = total assets;

$\Delta REV_{i,t}$ = change in revenues from the preceding year;

$PPE_{i,t}$ = gross property, plant, and equipment;

$\Delta AR_{i,t}$ = change in accounts receivables from the preceding year;

$CFO_{i\ t}$ = Cash flow from Operation for firm I at time t; and

$e_{i,t}$ = error term representing unexplained portion by the discretionary accruals models

In these three models, nondiscretionary accruals are estimated as a function of ΔREV and PPE (Jones model), (ΔREV - ΔAR) and PPE (modified Jones model), and ΔREV, PPE, and CFO (alternative accrual model). Then, the residual, the difference between total accruals and the fitted accruals, is the discretionary accruals estimate. By proportionally matching characteristics of firms listed on the Qatar Exchange by industry, we create a random sample from the U. S. stock market. We can safely interpret that the bigger the magnitude of residuals is, the poorer the reliability and accuracy of earnings for the sample firms is.

IV. Results

Table 3, Panel A summarizes regression results of three discretionary accruals models from the Qatar Exchange. The coefficient for the change in revenues from the preceding year ($\Delta REV_t / A_{i,t-1}$) from Jones model indicates that changes in total accruals are significantly caused by the change in revenues of the Qatari firms over the years. Consistent with previous studies, the coefficient (-9.449) of cash flow from operation from alternative accrual model is negatively significant (at the 1% level) with the change in total accruals. For the Qatar Exchange, Jones model and alternative accrual model produce significant F-statistic values (p = 0.003 and 0.000, respectively). Table 3, Panel B summarizes regression results of three

discretionary accruals models from the U.S. Stock Exchange. The coefficient for the change in revenues from the preceding year (ΔREV_t / $A_{i,t-1}$) from all three models indicates that changes in total accruals are significantly caused by the change in revenues of the U.S. firms over the years. The coefficient (-17.733) of cash flow from operation from alternative accrual model is also negatively significant (at the 1% level) with the change in total accruals. For the U.S. Stock Exchange, all three models produce significant F-statistic values (p = 0.000, 0.003 and 0.000, respectively). Finally, Table 4, Panel A and Panel B present summary statistics (minimum, maximum, mean and standard deviation) of residuals of discretionary accruals from Jones model, modified Jones model, and alternative accrual model for the years from 2004 to 2009 in the Qatar Exchange and the U.S. Stock Exchange, respectively. The value of discretionary accruals from Jones (modified Jones and alternative accruals) model ranges from 1.14 (1.13 and 1.23) (maximum) to -0.49 (-0.71 and -0.42) (minimum) with the mean value of 0.0364 (0.010 and 0.0795) in the Qatar Exchange. On the other hand, in the U.S. Stock Exchange, the value of discretionary accruals from Jones (modified Jones and alternative accruals) model ranges from 1.1508 (1.1508 and 1.0245) (maximum) to -0.6166 (-0.6154 and -0.5858) (minimum) with the mean value of -0.026473 (-0.025724 and -0.004208). Table 4, Panel C, shows the results of mean tests of all three models. The p-value in each model (0.0002, 0.0578, and 0.0000) indicates inequality of residuals of discretionary accruals from the Qatar Exchange and the U.S. Stock Exchange. Table 4, Panel D, presents the results of percent (%) positive residual tests of all three models. We conduct various mean proportion tests for positive discretionary accruals. Experimental results have demonstrated that mild departures from the assumptions of normality do not seriously affect the conclusions drawn from using these mean proportion tests with sample size greater than 30. Since the p-value in each model was less than 0.0001, we rejected the null hypothesis implying that residuals from the discretionary accrual models for the Qatari firms are greater in magnitude than those for the U.S. stock market listed firms.

V. Summary and Conclusion

This study investigates the residuals of discretionary accruals of listed firms in the Qatar Exchange and the U.S. stock market for the period 2004-2009. From the empirical results by three different accrual models, we find that Qatari firms in three industries (service, manufacturing and insurance) tend to manage earnings positively compared with those in the U.S. stock market. Our findings suggest that IFRS adoption and FIFO inventory method under inflationary environment by the Qatari firms resulted in greater residuals from all three accrual models than the U.S. stock market listed firms. The results have timely policy implication for the Qatar Exchange. The Qatari regulating body for financial reporting can use the results to enhance the quality of reported earnings of the Qatari firms to sustain (or improve) the marketability for Qatar Exchange-listed firms.

Table 1: Sample Selection

Panel A. Qatar Exchange

Listed Firms	
Total	43 Firms
Subtract: Banking Firms	(9) Firms
Sub Total	34 Firms
Firm Years (Number of Firms x 5 Years' Data)	
Total	170 Firm Years
Subtract: Missing data	(55) Firm Years
Final sample	115 Firm-Years

Panel B. U.S. Stock Exchange

Selected Firms with Matching SICs	
Total	193 Firms
Firm Years (Number of Firms x 5 Years' Data)	
Total	965 Firm Years
Subtract: Missing data	(29) Firm Years
Final sample	936 Firm-Years

Panel C. Number of Firms by Industry

	Qatar Exchange	U.S. Stock Exchange
Insurance	5	30
Manufacturing	7	30
Service	22	133
Total	34	193

Table 2 : Inflation Rates across Countries

Country	2003	2004	2005	2006	2007	2008	2009	2010
Qatar	2.3	3.0	8.8	7.2	13.7	15.1	-4.9	1.1
U.S.	2.3	2.5	3.2	2.5	2.9	3.8	-0.3	1.4

Table 3: Regression Results of Jones Model, Modified Jones Model, and Alternative Accrual Model

Panel A. Qatar Exchange

1. Jones Model (Adj-R^2 = 0.084)

a. ANOVA

Model	Sum of Squares	Df	Mean Square	F	Significance
Regression ***	0.461	2	0.231	6.264	0.003
Residual	4.162	113	0.037		
Total	4.624	115			

b. Coefficients

Model	Standardized Coefficients (beta)	T	Significance
Constant	-	-	-
REV/TA ***	-0.316	-3.535	0.001
G PPE/TA	-0.005	-0.053	0.958

2. Modified Jones Model (Adj-R^2 = 0.008)

a. ANOVA

Model	Sum of Squares	Df	Mean Square	F	Significance
Regression	0.117	2	0.058	1.466	0.235
Residual	4.507	113	0.040		
Total	4.624	115			

b. Coefficients

Model	Standardized Coefficients (beta)	T	Significance
Constant	-	-	-
CREVMINUSCREC *	-0.158	-1.703	0.091
G PPE/TA	-0.014	-0.153	0.879

3. Alternative Accrual Model (Adj-R^2 = 0.486)

a. ANOVA

Model	Sum of Squares	Df	Mean Square	F	Significance
Regression ***	2.308	3	0.769	37.197	0.000
Residual	2.316	112	0.021		
Total	4.624	115			

b. Coefficients

Model	Standardized Coefficients (beta)	T	Significance
Constant	-	-	-
REV/TA *	0.127	1.555	0.123
G PPE/TA	-0.023	-0.340	0.734
CFO/TA ***	-0.771	-9.449	0.000

Panel B. U.S. Stock Exchange

1. Jones Model (Adj-R^2 = 0.047)

a. ANOVA

Model	Sum of Squares	Df	Mean Square	F	Significance
Regression ***	0.472	2	0.236	24.239	0.000
Residual	9.102	934	0.010		
Total	9.574	936			

b. Coefficients

Model	Standardized Coefficients (beta)	T	Significance
Constant	-	-	-
REV/TA ***	0.131	4.098	0.000
G PPE/TA ***	-0.188	-5.887	0.000

2. Modified Jones Model (Adj-R^2 = 0.039)

a. ANOVA

Model	Sum of Squares	Df	Mean Square	F	Significance
Regression ***	0.397	2	0.198	20.178	0.000
Residual	9.178	934	0.010		
Total	9.574	936			

b. Coefficients

Model	Standardized Coefficients (beta)	T	Significance
Constant	-	-	-
CREVMINUSCREC ***	0.096	2.990	0.003
G PPE/TA ***	-0.185	-5.776	0.000

3. Alternative Accrual Model (Adj-R^2 = 0.287)

a. ANOVA

Model	Sum of Squares	Df	Mean Square	F	Significance
Regression ***	2.767	3	0.922	126.406	0.000
Residual	6.808	933	0.007		
Total	9.574	936			

b. Coefficients

Model	Standardized Coefficients (beta)	T	Significance
Constant	-	-	-
REV/TA ***	0.223	7.908	0.000
G PPE/TA	-0.021	-0.723	0.470
CFO/TA ***	-0.527	-17.733	0.000

Table 4: Residuals of Jones Model, Modified Jones Model, and Alternative Accrual Model

Panel A. Qatar Exchange

	N	Minimum	Maximum	Mean	Std. Deviation
Jones Model	116	-0.49	1.14	0.0364	0.19025
Modified Jones Model	116	-0.71	1.13	0.0100	0.19804
Alternative Accrual Model	116	-0.42	1.23	0.0795	0.14192

Panel B. U.S. Stock Exchange

	N	Minimum	Maximum	Mean	Std. Deviation
Jones Model	937	-0.6166	1.1508	-0.026473	0.0987449
Modified Jones Model	937	-0.6154	1.1508	-0.025724	0.0991539
Alternative Accrual Model	937	-0.5858	1.0245	-0.004208	0.0852883

Panel C. Mean Test

	Mean Difference	t-value	p at two-tailed
Jones Model	0.062835	3.49953	0.0002
Modified Jones Model	0.035754	1.91514	0.0578
Alternative Accrual Model	0.083722	6.21579	0.0000

Panel D. Percent (%) positive residual test

	Difference in Proportion	t-value	p at two-tailed
Jones Model	0.34665	7.399	0.0001
Modified Jones Model	0.27778	5.769	0.0001
Alternative Accrual Model	0.35414	10.069	0.0001

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Improvements in Accounting Students Competency: The case of Kuwait University

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Abstract

The purpose of this study is to investigate the competency of the accounting department graduates at Kuwait University. The investigation was carried at the accounting department of Kuwait University during the academic year 2010-2011. Students nominated for graduation were selected to participate in this study. In addition to a sequence of short questionnaires, a concise exit exam was used to explore student's competency in accounting. Results have showed poor awareness among students toward accounting in general which triggers an alarm of the quality of teaching methods and norms at Kuwait University. This requires great attention on the part of educators at Kuwait University to improve accounting department output.

I. Kuwait Accounting Education

Kuwait is considered a leading Arab country in terms of accounting education. In general, education in Kuwait has started more than 70 years back. University education, resembled by the only state university in the country has commenced in 1966. More regulation have been enforced when private universities decree was passed allowing for private higher education to be organized in Kuwait in 2002. Quality as well as tight control on providing higher education has been always the ultimate goal for the council for private universities.

Accounting education has been overlooked by college of business administration –CBA- as a full degree of 4 years span. Accounting program is set and periodically reviewed by CBA as it went through accreditation process since late 90's of last decade. Moreover, accreditation maintenance has also put some academic factors esteeming for excellence.

CBA has introduced exit exam process in 2009 for the first time since inception. Results revealed some areas of concern that require more attention by CBA in order to better maintain the international accreditation by AACBA. Neither Kuwait university bylaws nor higher education regulation in Kuwait has any reference to qualifying such exam among university graduates.

II. Study's Objectives & Importance

The objective of this study is to provide accounting educators with sample strategies and best practice classroom techniques that directly address the development of students' competencies which in turn assist in the implementation of the core competencies "**curriculum development**". In order to evaluate how effectively CBA courses or entire accounting programs address the competencies, some academic measures have to be put in force. Thus, this study calls for wider introduction of an exit exam by concerned parties such as ministry of higher education, both public and private universities, accounting departments, and the accounting profession at large. Staff, students, and accreditation committees can use such tool as a benchmark for assessing an accounting program.

Identifying the factors that affect student's competency is of paramount importance as it assists in reforming learning objectives, activities as well as teaching techniques at the

accounting department. Moreover, derived results would underline various factors affecting student performance such as the GPA, aptitude test, exit exam results, and other social elements. At large, it also assist in achieving optimal utilization of resources as the country come across a massive and very an aggressive development plan ever.

The Study

The majority of studies have investigated separately the effect of two factors on student performance and perceptions: (a) various active learning techniques and (b) the use of modern educational technologies. These studies rarely tested and examined the effect of a combination of these two factors when used simultaneously. Thus reported conclusions were founded on the application of active learning techniques within parts of accounting courses rather than adopting a comprehensive competencies development plan.

To reach such competencies, a sequence of serial short questionnaires and generic queries were circulated to potential accounting graduates during the entire semester. These questionnaires test student's knowledge in accounting as well as their understanding of business related subjects as taught within CBA. In addition, accounting competency exam is conducted in order to verify how CBA students are opt to accounting era. I used students registered in my class as research subjects. Student performance was measured by their accounting and business related resolute knowledge.

It is noted that many students do not read before the lecture on the questioned material even though they were reminded in advance, not even the best students. Some students read the material for the first time while completing the exit exam sheet. This was borne out in the data. Both low GPA and high GPA students in the study spent significantly more time doing the exam than they spent reading before the lecture. This data shows that reading while completing the exam may be just as beneficial to the student as reading before the lecture.

It is not always possible to ascertain the personality or learning preference characteristics of students, nor would it be always feasible to adopt a number of different styles of delivering course material and still cover all of the material. The study did not control for student personality or learning preference characteristics, as class time was not permitted to administer the requisite tests. This is a limitation of the study which will be discussed further in the limitations section of the paper. However, instructor and teaching method effects were controlled for, as well as GPA, ACT, and declared major.

III. Prior Research

Although no previous research specifically addressing the impact of compressed or block courses on student learning of accountancy was found, the literature contains a number of studies assessing student performance in specific accounting courses. Some of these studies focus on the determinants of student performance in accounting courses, while others investigate the impact of large section size versus small section size on student performance. Other studies have been conducted on the cognitive and personality characteristics of

students. Studies on the cognitive and personality characteristics of students offer implications on how students learn and on how instructors should style their teaching.

Earlier studies have emphasized the need to introduce changes in accounting education to excel students' competencies. The 1989 Big Eight white paper, "Perspectives on Education: Capabilities for Success in the Accounting Profession," examined concerns about accounting graduates. In 1994, the Institute of Management Accountants (IMA) presented the results of its study addressing the needs of corporate accountants, "What Corporate America Wants in Entry-Level Accountants." The AICPA issued its "CPA Vision: Focus on the Horizon" in 1998 (Foster and Cynthia, 2007). The Accounting Education Change Commission (AECC) was created by the AAA in 1989 to develop a "change of focus in the philosophy of accounting education." The AECC concluded that accounting education was not keeping pace with the profession. Since then Accounting education and research began a slow transformation.

In July 1999, the first component of the Framework—the set of core competencies—was released. In it, three categories of competencies are delineated: functional, personal, and broad business perspective. The competencies address the skills necessary for students to receive a well-rounded accounting education regardless of their choice of career path, and they encourage lifelong learning.

In a matter of fact, since the last 40 years accounting education had experienced tremendous pressure to change and adapt to a dynamic business environment. The commonly recognized forces for change include (but are not limited to) the 150-hour requirement for eligibility to sit for the Certified Public Accountant (CPA) exam, discontent from the public accounting profession and corporate accounting recruiters with recent accounting graduates, the explosion of accounting-related knowledge, advances in technology, fluctuating enrollments in accounting programs, increasing levels of competition and globalization, and expanded legal liability for the accounting profession (Mueller and Simmons, 1989; Frederickson and Pratt 1995; Foster and Cynthia 2007).

Responding to these forces for change is especially challenging in view of the fact that many of the forces for change are in conflict with each other. For example, at a time when the quantity of information required to be technically competent is growing exponentially, there is pressure to reduce the influence of the CPA examination on accounting curricula, focusing on broader, big-picture issues [Patten and Williams, 1990]. The needs of corporate accounting employers differ from the needs of public accounting employers [Siegel and Kulesza, 1996]. Conspicuously absent from the list of forces for change is the student. The student is often viewed as the product or as a constraint [Frederickson and Pratt, 1995].

Remarkable research have concluded that there is limited evidence supporting many competency-based approaches, thus, as many as 14 research questions were identified to help policy makers to more effectively address policy matters related to competency-based

education and assessment (Boritz and Carnaghan, 2003).

Formerly, intensive Kolb's learning styles studies have concluded that no single method of teaching satisfies all students. Students with different learning styles need different approaches (Baker et al, 1986). Some authors went too far in proposing quite different style of accounting curriculum based on allowing students to select on their own or what is called "Cafeteria style" (Jackson and Cherrington, 2002). Likewise, other approaches were founded on a description of a four step active student-centered approach to faculty development, course design and delivery referred to as the Resource-Enriched Learning Model (Lavoie and Rosman, 2007).

Cognitive and Personality Characteristics of Students

In one accounting study, Wolk and Cates [1994] investigated the problem-solving styles of accounting students using Kirton's [1976] dichotomy of adapters versus innovators. They found that accounting students are less innovative (preferring loosely structured problems) and more adaptive (preferring tightly structured problems) than other business majors.

Two accounting studies used Kolb's Learning Style Inventory [Sharp et al., 1997]. Auyeng and Sands [1996] examined cultural characteristics of Australian, Hong Kong, and Taiwanese accounting students. They found that the Hong Kong and Taiwanese students are more abstract and reflective, and less concrete and active, while Australian students exhibit these characteristics in the opposite direction of the accounting students in Hong Kong and Taiwan. Pushkin [1991] also used Kolb's Learning Style Inventory to compare the learning style preferred by female accounting students versus the learning style preferred by male students. She found that while both males and females may do well in inductive reasoning and logical assimilation of information, male learning involved thinking characteristics, while female learning tended toward observation. Booth and Winzar [1993] sampled accounting majors in Australia, studying their personality characteristics. They found that accounting students rely less on intuition, feeling, and perception, and more on sensation, thinking, and judgment. Booth and Winzar conclude that accounting educators should adopt a multiplicity of methods in their teaching style to accommodate the diversity of personalities they find in accounting students. A study on how to incorporate problem-based and peer-assisted learning tasks can promote many of the skills and competencies so desired by educators and universities (Alder & Milne, 1997).

In Indonesia, an analysis identified skills to be covered in each course and the entire program. Using surveys, focus groups and meetings all stakeholders were consulted as to the needs of the accounting profession by business, government and other organizations. As a result of the findings, the accounting program was redesigned to incorporate an adapted set of competencies which would comply with IFAC requirements but be sensitive to the current contextual position of the accounting profession in Indonesia (Mula, 2007).

As was noted in the literature review, accounting students' performance factors varies (i.e., student personality characteristics, learning styles, instructor methods, etc.) but all may affect student performance results. Prior research has found that classroom assessment have many beneficial effects on students self determination and overall intrinsic motivation to learn (Haugen & Becker, 2005).

Among the many studies testing for factors affecting accounting students' performance, Nashwa examined the impact of mini-tests on accounting students ' performance in intermediate accounting classes during four semesters. Results indicated that students' performance on mini-tests after lecture was much higher than their performance on mini-tests before lecture (Nashwa, 2002).

Others have focused on GPA and accounting teaching techniques where results showed different categorize of respondents all depend on how accounting is taught (Ewer et al, 2002). Many accounting educators believe that the student learning of accounting is better facilitated over a longer period of time, rather than a shorter period of time. Students taking introductory accounting over four weeks fare about as well as students who take introductory accounting over a traditional 16-week period. These results have potential importance beyond accounting education and provide support to universities offering more block courses to better serve individual student needs (Bridges, 2002).

Similar study was carried out to investigates the effects of class size, high school accounting, aptitude and attitude on learning , measured by the difference between post-test and pre-test scores, in an undergraduate financial accounting. It concluded that midterm grade (aptitude) and changes in perception about the relevance of the class on business-related issues (attitude) motivate teach (Harrington et al, 2000).

At Southwest Missouri State University, student has been added to the list of forces for change. Students have often requested that the introductory level accounting courses, Introduction to Financial Accounting (ACC 201) and Introduction to Managerial Accounting (ACC 211), be offered in a format that would allow them to complete both courses in the summer term. Similar study was carried out at Purdue University and resulted similarly.

Comparable results are reported in many studies (Abdolmohammadi & Baker, 2007; Ashbaugh & Johnstone, 2000; Cook et al, 2011; Dallimore et al, 2010; Duff & McKinsty, 2007; Elikai & Schuhmann, 2010; Fleming Lightner, 2009; Fogarty & Markarian, 2007; Gabbin & Wood, 2008; Geary et al, 2010; Hermanson, 2008; Hilton & Phillips, 2010; Ingram & Howard, 1998; Inman et al, 1989; Krausz et al, 1999; Miller & Stone, 2009; Milliron, 2008; Phillips & Phillips, 2007; Phillips & Johnson, 2011; Rockers, 2006; Shoulders & Hicks, 2008). A more comprehensive research on publications related to accounting education changes in recent years is well articulated by Watson et al (2007). On a more technical frontier, a study has concluded that general computer knowledge, searching, getting connected, and spreadsheets are important skills for students seeking internships and full-time positions. These skills are best developed while a student is still in school (Romney et al, 2011).

IV. The Data

This study used data made available by students' affairs office at CBA which are maintained on a computerized database. The number of students in the sample of this study is 183 students, which represents the total students' population on the graduation list of the academic year 2009-2010 (fall, spring, and summer graduation). Graduates from the accounting program during the 2010-2011 academic year represent 31.6% of the total students graduating during the same year from CBA, and 5.9% of those graduating from all KU colleges.

Candidates' graduates from the accounting program during the 2010-2011 year were chosen as the subject of this study in order to reflect as close as possible the most recent graduation where data were available. In addition, all of those graduates were admitted into the accounting program after the year 2001-2002 when minor change in the accounting curriculum was introduced, and was effective since the 2003-2004 academic years.

Descriptive Data Analysis

Basically, initial results revealed that student's competencies are far from anticipated –table 1. On the outset, poor ability to communicate is widely observed among respondent despite the fact that they have spent the last 3 years in the same campus studying almost in the same sections. On the accounting awareness aspect, norms among students are very generic even when it comes to defining basic concepts related to accounting era and the auditing profession. For example, when asked to reply to a very fundamental question "What to do you know about accounting?" responses were amazingly; poor (32%), fair (28%), and average (39%).

Insert exhibit 1 here

Moreover, lack of consistency with respect to accounting major and sub-content is common among respondents. Most students have completed their required major sheet courses with great similarity in courses requirement & grading system.

Few have come across self learning experience within CBA classes or any other KU college. Majority favour self learning tools in terms of extra-curriculum content. Also, few students have come across extra-assignments as compensation for poor exam(s) performance which led them being frustrated and disappointed with their grades. Some have indicated that the root of the problem goes beyond the capabilities of the university as it is related to the high schools outputs, while other have clearly put all the blame on KU and CBA courses especially at the entry level. All in all, preliminary reading of student's feedback surely raises an issue to be pondered by KU officials.

V. Statistical Data Analysis

Further statistical data analysis of student's responses was employed to highlights factors responsible for student's performance- table 1. This includes some general attributes such as

sex, age, nationality, high school grade points, English aptitude performance, and high school specialization (Arts or Sciences).

Table 1 lists descriptive statistics for the 183 students comprising the study sample. The data shows that non-Kuwaiti students, as compared with Kuwaiti students, are about the same age, have higher secondary school scores, and consistently outperform Kuwaiti students in terms of GPA on accounting courses upon graduation.

Insert table 1 here

On the other side, table 2 summarizes the comparisons made regarding student attributes and student performance in the accounting information systems course (ACC- 444) as taught in both fall and spring (13-weeks) versus summer (six-week) semesters. The table provides two mean student performance predictors and three mean performance measures. The three student performance measures are regular test performance, comprehensive final exam performance, and total grade based on points available. The two student performance predictors are ACT scores and GPA.

To control for student attributes causing a difference in performance, students were categorized according to ACT and GPA. ACT scores and student OPA were used to categorize students into two categories: superior or excellent, and satisfactory or other. At the university, an ACT score of 24 is the minimum score required to receive consideration for any of the general academic scholarships. Therefore, any students with an ACT score of 24 or more were classified as superior or excellent potential. A GPA of 3.00 at the university is characterized as superior, and a GPA of 4.00 is characterized as excellent. Therefore, students with GPAs of 3.00 or more were classified as having superior or excellent past performance. Students were also sub-categorized according to their declared specialization in accounting based on the type of elective accounting course taken. Although, one could argue for using accountancy as one of the sub-categories, yet none of the students have second major outside the accounting track. Also, another option was to classify students according to business majors and non-business majors. Yet, again, none of the students registering in acc-444 is of another college as per CBA enrolment requirement.

The Parameter

Based on the above discussion, the students' overall competency was hypothesized to be a function of the following factors: (1) Secondary school academic performance and type of secondary school branch (sciences or arts), (2) performance in all accounting courses, (3) Scores of first, second, third, and final exams of the Acc-444 course, and (4) some demographic variables.

Pre-college academic performance is measured by scores in secondary school uniform examination, measured in a percentage form. A dichotomous variable for branch of study in secondary school was included since it affects the minimum scores required to be admitted into the accounting program according to the current admission policy adopted by KU.

Grades achieved by students in lower division accounting courses were chosen to reflect the scholastic aptitude in accounting subject; a consideration worthy of testing which may have implications for designing admission policy into accounting program. Overall GPA after the first year and after the second year in the accounting program was chosen to reflect the general academic performance in early years of residence at college (Grades for all students comprising the sample were measured according to a 4-point scale used by KU. Three demographic variables were included in the model: Students' age upon admission to the college, nationality (Kuwaiti or non-Kuwaiti), and sex. The model can be specified as follows:

GPA = GPA1 + GPA2 + FA1 + FA2 + FA3 + CA1 + HSS + HSB + AGE + NAT + SEX

Where

GPA = Performance of student (GPA all accounting courses)

GPA1 = Overall GPA earned at the end of first year in college (30 Credit hours)

GPA2 = Overall GPA earned at the end of second year in college (60 Credit hours)

FA1 = Grade earned in the first exam – Acc 444

FA2 = Grade earned in the second exam – Acc 444

FA3 = Grade earned in the Third – Acc 444

CA1 = Grade earned in the Final Exam – Acc 444

HSS = Score in secondary school certificate examination; expressed in a percentage form

HSB = Branch of study (stream) in secondary school (sciences =1, arts =0)

AGE = Age of student upon admission to college

NAT = A dichotomous variable representing student's nationality (Kuwaiti = 1, Non-Kuwaiti = 0).

SEX = Sex of student (Male = 1, Female = 0).

Data Analysis Procedure

Descriptive statistics were performed for the 183 students comprising the study sample, and also for four individual sub-samples of students determined by dividing the full sample along two dimensions as follows:

1. Nationality: Kuwaiti citizens (176 students), and non-Kuwaiti citizens (7 students)
2. Secondary school branch: Arts stream (85 students), and sciences stream (98 students).

Correlation analysis was conducted in order to measure the degree of association of each independent variable with students' overall GPA earned upon graduation. Since correlation analysis ignores the joint contribution of independent variables, stepwise multiple regression

analysis was used to analyse the relationships between students' performance and the independent variables. Linear regression model was used because simple plots of the data provided no evidence on the existence of non-linear relationships. Correlation and multiple regression analysis were also conducted separately on sub-samples.

The statistics also show that students entering accounting program from sciences stream of the secondary school, as compared with students from arts stream, tend to perform better in individual accounting courses as well as in terms of GPA upon graduation, although their secondary school scores upon admission (HSS) are lower. In addition the statistics presented in Table 1 reveal that students tend to improve their overall performance as they move from exam 1 to exam 2 until the final as supported by scores of FA1, FA2, and FA3. However, students' performance in accounting courses did not improve as they progressed in their study of accounting.

Correlation Analysis

Table 2 presents the results of Pearson Product-Moment correlation coefficients of each independent variable with GPA earned upon graduation, for the full sample, as well as for each of the four individual sub-samples. The correlations presented in Table 2 allow several observations. First, GPA2 exhibited the highest correlation with the dependent variable GPA, followed by GPA1, and then by HSS. Correlation coefficients between GPA and these three variables were .895, .777, and .619 respectively for all students sample. Second, as expected, all independent variables reflecting scores in individual accounting courses (FA1, FA2, FA2, CA1) or overall GPA (HSS, GPA1, GPA2) had positive correlations with GPA (ranging from .445 to .942) and all coefficients are significant at the .01 level.

Insert table 2 here

The three demographic independent variables (Sex, nationality, and age) had negative correlations with GPA which indicate that a female non-Kuwaiti student of a younger age would be expected to perform better in the accounting program. However, sex and secondary school branch had rather low correlation coefficients, which are not significant at the .01 level. Third, the correlations between GPA and scores in FA2, and FA3, and CA1 are about equal (.598, .594, and .599 respectively), and show consistent patterns when considering sub-samples of Kuwaiti versus non-Kuwaiti, and sciences stream versus arts stream. Fourth, the coefficient on FA1 is positive and significant at the .001 level, but it is lower than those on the other accounting courses (FA2, FA3, and CA1).

Regression Results

Using stepwise regression process in the Statistical Package for Social Sciences (windows. SPSS), a series of different models were developed. In model 1, the dependent variable was GPA upon graduation (GPA), and data on all variables were employed as independent variables. Table 3 presents the results of the stepwise regression analysis for the full sample. Table 4 and Table 5 present analogous results for model 1 derived separately from the four

sub-samples. Each table reports the beta coefficient, the F ratio, as well as the R2 change for each independent variable entered into regression equation. The F ratio indicates the relative contribution of each independent variable in explaining the dependent variable when it is the last variable entered in the regression model. This F ratio and its significance level (given in parenthesis) help in assessing the importance of a single variable in explaining the variation in the dependent variable. The R2 and the Adjusted R2 for the model as a whole are reported at the end of each table. Their values show that the model is significant at the .001 level. Thus the model provided a good fit for the GPA variable.

Insert table 3, 4, & 5 here

As anticipated, the sign for all beta coefficients of the independent variables entered the regression were positive, except for GPA1 achieved by students with arts stream in secondary school. Thus, GPA at the end of freshman year for these students was negatively contributing to their over-all performance in accounting program.

The most important predictor variable influencing performance in accounting program turned out to be GPA at the end of sophomore year (GPA2). GPA2 was consistently having the largest marginal contribution in explaining performance across all sub-samples as well as for the full sample, and was highly statistically significant. This reinforces the initial conclusion that followed from correlation analysis reported earlier (Table 2). GPA2 was followed by scores in secondary school examination (HSS) which is currently taken as the main criterion in admitting students into the accounting program.

In addition, the results reported in Table 3 indicate that CA1 and FA3 contribute significantly to an explanation of the variance in students' performance in accounting program. However, as reported in Tables 4 and 5, CA1 appeared as a significant explanatory variable only for Kuwaitis' and for sciences' sub-samples, while FA3 appeared significant for only non-Kuwaitis' and sciences sub-samples. It can be noticed also from Table 5 that none of the independent variables representing grades in individual accounting courses could be considered as a significant factor in explaining overall performance of students graduating from arts stream in secondary schools. Rather, it is their overall performance in secondary school (HSS) and GPA2, which significantly positively associated with success in accounting program. The effect of PA1 in explaining overall performance was not significant except for the non-Kuwaiti students (Table 4).

Other independent variables, including demographic variables (sex, nationality, and age) and secondary school stream did not enter the regression equation, and thus, did not contribute to explaining variation in students' performance. In other word, they showed little usefulness as explanatory variables when used jointly with other variables (GPA2, HSS, CA1, and FA3).

Alternative Performance Criterion

Alternatively, Model II was developed using the students' GPA on all accounting courses upon graduation (MGPA) as a performance measure in order to identify factors associated

with performance in accounting courses only. The stepwise regression results of Model II are presented in table 6. The results indicate that Model II provided a good fit for the MGPA variable as F ratio for the model was statistically significant at the .001 level. Both Models I and II identified GPA2, HSS, CA1, and FA3 as significant factors in explaining performance whether in terms of overall GPA in all courses upon graduation (GPA) or in terms of accounting courses only (MGPA). GPA at the end of second year achieved consistent results in both models as it had the largest F ratio and R2 change. However, the order the other variables entered the regression equations (HSS, CA1, and FA3), and thus their relative importance in explaining performance when used jointly with other predictors where somewhat different in the two models.

Insert table 6 here

In addition, results of Model II indicate that there is additional usefulness in including FA2 as a predictor of performance as measured by MGPA. As anticipated, more weights will be given to performance in individual accounting courses if overall success in accounting program is being judged on the basis of MWA. This explains the relatively higher explanatory power of the three individual accounting courses FA2, CA1, and FA3 over HSS in Model II as compared with model I. This conclusion reinforces the observation found from the rather high correlation coefficient between MGPA and individual accounting courses (Correlation coefficients between MGPA and PA1, FA2, and CA1 were .5315, .6705. and .6430 respectively).

Multicollinearity

Multicollinearity refers to the condition of a high degree of interdependence among the independent variables which causes difficulties in assessing the individual effect of an independent variable upon the dependent variable. Table 7 presents results of a simple pair wise correlation analysis for the various independent variables. The results show few cases of moderate Interco relations that exist among some independent variables, particularly among GPA1, GPA2, FA1, FA2, FA3, and CA1. To investigate the existence of multicollinearity in the regression model, tolerance criterion has been applied which requires that the tolerance of each variable in the model (a measure of the proportion of variability not explained by the other variables) should be high enough to be acceptable. Tolerance of independent variables in regression equation for Model I and Model II were between .4 and .75. Based on these results it was judged that multicollinearity does not appear to be a serious problem in the model.

Insert table 7 here

In addition, in view of relatively moderate Interco relations among the abovementioned independent variables and as a remedy, an alternative regression model was developed (Model III) in which two collinear variables (FA3 and CA1) were dropped from the regression in Model I. Table 8 reports the results of stepwise regression for Model III for the

full sample as well as for the four sub-samples. All regressions were found to be statistically significant at the .001 level.

The results presented in Table 8 indicate that dropping FA3 and CA1 did not change the previous conclusion of Model I regarding the importance of GPA2 in predicting students' overall performance. GPA2 by far provided the most important variable in explaining success in accounting program; a conclusion that is consistent throughout the various regression models developed in this study. When comparing results of Model III (Table 8) with analogous results of Model I (Tables 3,4, and 5), it appears that the relative contribution of HSS to explaining performance comes next to GPA2 in the two models. In addition, the effect of dropping the two independent variables (CA1 and FA3) allowed FA2 (grades in the second introductory course) to enter the regression equation for the full sample as well as for the two sub-samples representing Kuwaiti students and graduates of sciences stream of secondary schools. Grades in the first introductory accounting course again showed a significant explanatory power in predicting performance of non-Kuwaiti students only. Since it is more desirable to identify candidates for admission to accounting program at an earlier point in their academic study, Model III provides an advantage over Model I in identifying factors related to overall performance. The omission of CA1 and FA3 in Model III resulted in a reduction in the overall R2 of the full sample by only .014 when compared with that of Model I (.864 - .850). Therefore, results of Model III suggests that grades in the second introductory accounting (PA2) could be regarded as a substitute for the more advanced accounting courses (CA1 and FA3), and thus permitting an earlier prediction of students' performance.

Insert table 8 here

Conclusions

It is paramount to find that the GPA earned by accounting majors at the end of second year in college is the most important variable associated with their overall performance upon graduation from accounting program. None of the other variables examined in the study (Nationality, sex, age, and secondary school branch) provided a significant contribution in predicting performance when used jointly with other variables, while grades in the second introductory accounting course are better associated with students performance.

These Findings imply that better use of available resources at Kuwait University may be achieved by focusing on this academic year within the accounting program. Proper foundation in basic financial accounting knowledge (measured by a diagnostic assessment) and overall level of academic ability (measured by cumulative GPA) are both important indicators of success in the first intermediate accounting class. Even at a university with open admissions student performance in intermediate accounting can be improved.

A limitation of this study is, however, that it utilizes a sample size of only 183 students. A replication of this study using a larger sample size is advised. Future studies may, also,

include testing for other non-parametric variables affecting accounting student's performance such as the influence of competitive behaviour among junior students, the growing pressure by the accounting profession to promote accounting graduates, and the effect of enrolment conditions on students. In over all, more emphasis should be given to the importance of student's performance and subsequently, their competencies, in order to fulfil the mission of CBA as well as accounting program.

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TABLE 1

Descriptive Statistics

(Continuous variables)

Variable	Full sample Mean (std.dev.)	Kuwaiti Mean (std.dev.)	Non-Kuwait Mean (std.dev.)	Sciences Mean (std.dev.)	Arts Mean (std.dev.)
AGE	19,40 19.40	19.23v	19.74	19.35	19.46
	(3.10)	(2.93)	(3.42)	(2.84)	(3.39)
HSS	73,91 73.91v	71.69	78.35	71.94	76.18
	(11.41)	(0.89)	(11.21)	(13.21)	(8.42)
GPA	4,88 4.88	4.61	5.44	5.00	4.75
	(1.25)	(1.10)	(1.37)	(1.33)	(1.16)
MGPA	4.69	4.42	5.23	4.82	4,54
	(1.46)	(1.30)	(1.62)	(1.54)	(1.37)
GPA1	4,25 4.25	3.73	5.27	4.23	4.26
	(2.03)	(1.98)	(1.73)	(2.29)	(1.69)
GPA2	4.75 4.75	4.40	5.45	4.90	4.58
	(1.41)	(1.30)	(1.38)	(1.57)	(1.19)
FA1	5.35	5.05	5.87	5.80	4.88
	(2.32)	(2.34)	(2.22)	(2.22)	(2.34)
FA2	5.37	5.20	5.72	5.56	5.15
	(2.18)	(2.19)	(2.13)	(2.26)	(2.07)
FA3	4.68	4.29	5.39	4.92	4.43
	(2.03)	42.04)	(1.83)	(2.13)	(1.90)
CA1	4.77	4.62	5.03	4.84	4.69
	(2.26)	(2.24)	(2.30)	(2.21)	(2.33)

TABLE 2

Pearson Product-Moment Correlation Coefficients

of Independent Variables with GPA

Variable	Full Sample	Kuwaiti	Non-Kuwaiti	Science	Arts
SEX	-.105	-.147	-.107	.038	-.289*
NAT	-.327**	-	-	-.436**	-.124
AGE	-.232*	-.194*	-.420**	-.296*	-.167
ESB	.128	.070	.228	-	-
HSS	.619**	.445**	.766**	.657**	.607**
GPA1	.777**	.684**	.854**	.799**	.736**
GPA2	.895**	.837**	.942**	.875**	.924**
FA1	.497**	.374**	.641**	.504**	.465**
FA2	.598**	.510**	.712**	.684**	.475**
FA3	.594**	.496**	.679**	.643**	.512**
CA1	.599**	.532**	.719**	.615**	.585**

* Significant at the .01 level ** Significant at the .001 level

TABLE 3

Summary of Regression Analysis - Full Sample

Model I Dependent Variable GPA

Independent Variable Entering the Equation	Beta Coeff	F Ratio (Prob.)	R^2 Change
GPA2	.599	236.99 (.000)	.800
HSS	.030	50.69 (.000)	.043
CA1	.067	11.88 (.001)	.013
FA3	.068	9.32 (.003)	.008

F = 261.17 R^2 = .864 adjusted R^2 = .861

TABLE 4

Summary of Regression Analysis

Sample Split According to Nationality

Model 1 - Dependent Variable : GPA

Independent Variable Entering the Equation	Kuwaiti Students			Non-Kuwaiti Students		
	Beta Coef	F Ratio (Prob.)	R^2 Change	Beta Coef.	F Ratio (Prob.)	R^2 Change
GPA2	.586	249.41 (.000)	.700	.634	456.34 (.000)	.887
HSS	.024	17.87 (.000)	.043	.032	30.85 (.000)	.040
CA1	.078	11.22 (.001)	.025	-	-	-
FA3	-	-	-	.080	5.45 (.023)	.006
FA2	.060	4.97 (.028)	.011	-	-	-
FA1	-	-	-	.064	5.45 (.023)	.006

F = 91.37 F = 212.96 R^2 = .779 R^2 = .939 Adjusted R^2 = .770 Adjusted R^2 = .935

TABLE 5

Summary of Regression Analysis

Sample Split According to Branch in Secondary School

Model I - Dependent Variable: GPA

Independent Variable Entering the Equation	Sciences Branch			Arts Branch		
	Beta Coef	F Ratio (Prob.)	R^2 Change	Beta Coef.	F Ratio (Prob.)	R^2 Change
GPA2	.494	273.52 (.000)	.765	.975	470.84 (.000)	.853
HSS	.028	31.91 (.000)	.065	.025	11.60 (.001)	.019
CA1	.070	13.26 (.001)	.024	-	-	-
FA2	.071	6.97 (.010)	.012	-	-	-
FA3	.074	4.79 (.032)	.008	-	-	-
GPA1	-	-	-	-.139	6.74 (.011)	.010

F = 110.08 F = 196.59 R^2 = .874 R^2 = .882 Adjusted R^2 = .865
adjusted R^2 = .877

TABLE 6

Summary of Regression Analysis- Full Sample

Model II - Dependent Variable MGPA

Independent Variable Enteric the Equation	Beta Coeff	F Ratio (Prob.)	R2 Chance
GPA2	.432	58.02 (.000)	.668
FA2	.137	20.93 (.000)	.063
CA1	.129	21.494 (.000)	.036
FA3	.146	20.93 (.000)	.020
HSS	.025	17.17 (.001)	.020

F = 136.25 R2 = .807 Adjusted R2 = .801

TABLE 7

Simple Correlation Coefficients Between

Independent Variables

	SEX	NAT	AGE	HSB	HSS	GPA1	GPA2	FA1	PA2	FA3	CA1
SEX	1	-.05	.30	.05	-.26	-.08	-.04	-.06	.01	.14	-.05
NAT		1	-.15	-.26	-.22	-.34	-.38	-.17	-.14	-.26	-.09
AGE			1 -.15	-.07	-.37	-.14	-.19	.11	-.07	-.02	-.10
HSB				1	-.07	.14	.16	-.22	.09	.13	.05
HSS					1	.48	.49	.29	.37	.23	.33
GPA1						1	.87	.52	.52	.47	.40
GPA2							1	.49	.57	.58	.55
FA1								1	.42	.42	.34
PA2									1	.47	.45
FA3										1	.42
CA1											1

TABLE 8

Summary of Regression Analysis

Model III - Dependent Variable GPA

Full Sample

Independent variable Entering the Equation	F Ratio P Ratio (Prob.).	R2 Chance
GPA2	676.95 (.000)	.800
HSS	45.49 (.000)	.043
PA2	7.65 (.020)	.007

F = 315.11 R2 = .850 Adjusted R~ = .847

Sample Split

Independent Variable Entering the Equation	Kuwaiti		Non-Kuwaiti		Sciences		Arts	
	F (Pr.	Rz change	F (Pr)	R2 R2 change	F (Pr.	Rz change	F (Pr.	Rz change
GPA2	256.91 (.000)	.70	450.54 (.000)	.88	273.52 (.000)	.76	460.90 (.000)	.85
HSS	18.11 (.000)	.04	29.57 (.000)	.04	31.95 (.000)	.07	11.81 (.001)	.02
FA2	6.58 (.012)	.01	-	-	13.18 (.001)	.02	-	-
FA1	-	-	7.66 (.008)	.01	-	-	-	-
F	112.92		262.05		159.63		269.76	
R2		.75		.93		.85		.87
Adjusted R2		.74		.92		.84		.86

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Asset Correlation and Evidence from UK Firms

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Abstract

In this paper we estimate asset correlation with an empirical method, and test the relationship between asset correlation and default probability and test whether or not size is related to asset correlation. We employ Merton option pricing model (OPM) and Capital asset pricing model (CAPM) and use a sample of UK firms for the period between 2000 and 2009. Empirical results suggest that there is a negative relationship between asset correlation and default probability, which is consistent with capital requirements formula provided by Basel II. We also find that asset correlation is positively related to firms' size.

JEL classifications: M4
Keywords: The New Basel Accord, Asymptotic single risk factor (ASRF), Merton model, Asset correlation, Size effect

I. Introduction

More recently, the issue of financial stability in the wake of economic integration and globalization, as highlighted by the 1997 Asian crisis, has received a lot of attention. The Basel Committee on Banking Supervision (BCBS) suggests that the international banks have to maintain a certain level of capital requirement and also sets a framework on how banks and depository institutions must manage their capital. The categorization of assets and capital is highly standardized so that it can be risk weighted. Internationally, the BCBS housed at the Bank for International Settlements (BIS) affect each country's banking capital requirements.

Since 1930, central banks cooperated through the regular meetings to develop its own research in financial and monetary economics and make a crucial contribution to the collection, compilation and dissemination of economic and financial statistics. Before the early 1970s, the BIS focused on implementing and defending the Bretton Woods system. In the 1970s and 1980s, the focus was on dealing with cross-border capital flows following the oil crises and the international debt crisis. The 1970s crisis also brought the issue of regulatory supervision of internationally active banks to the fore, resulting in the 1988 Basel Capital Accord and its "Basel II" revision of 2001-06. In the year, the Committee decided to introduce a capital measurement system commonly referred to as the Basel Accord. This framework is now being replaced by a new and significantly more complex capital adequacy framework commonly known as Basel II. The revised framework for regulation (Basel II) includes three choices for banks to calculate credit risk capital requirements: (1) a revised standardized approach, (2) an internal ratings-based (IRB) foundation approach, and (3) an advanced IRB approach. While Basel II significantly alters the calculation of the risk weights, it leaves alone the calculation of the capital. The capital ratio is the percentage of a bank's capital to its risk-weighted assets. Weights are defined by risk-sensitivity ratios whose calculation is dictated under the relevant Accord.

If the formulas of capital charges provided by Basel II are not correct, it may have negative impact on deposits. The asymptotic single risk factor (ASRF) approach is a general method to calculate capital requirements under FIRB approach. Asset correlation, the correlation of the systematic risk factor with a firm's assets, is an important variable used in ASRF approach. Since there has no clear directions between asset correlation and probability of default from previous studies (see Lopez, 2002; Servigny and Renault, 2002; **Düllmann and Scheule, 2003), we try to find out their relation in this paper.** We observe that the model is consistent with regulation for credit risk provided by Basel committee. Asset correlation is a negatively related to probability of default but a positively related to firms' size.

The rest of the paper is organized as follows. The paper first reviews the literatures discussed about the calculation of capital requirements under FIRB approach, features of asset correlation in Section 2. Section 3 develops the methods for the study and summarizes descriptive statistics. Empirical results are presented in Section 4, and conclusions are made in the final section.

II. Literature Review

II.1. Risk weighted functions for credit risk under FIRB approach

The purpose of the 1988 Basel Accord (Basel I) was to strengthen and regularize the global banking system. The expectation was that countries would implement and modify the basic model of the Accord for their own markets. But there are several limitations under Basel I. First, there was no clear description for the 8% capital requirements. Second, all corporate bonds have the same capital requirements regardless of different maturity and seniority. Third, risk-reducing diversification and off-balance-sheet recognition were ignored.

The revised framework (Basel II) is developed to accommodate the rapid changes and innovation in financial markets that were lacking under Basel I. The Basel II Accord is aimed at large international banks and all subsidiaries, holding companies, and security firms operating under parent firm. The main goal of Basel II is to provide more precise classifications of risk levels between banks. Ultimately, Basel II developed three choices for the calculation of credit risk capital charges: (1) a standardized approach, (2) an internal ratings-based (IRB) foundation approach, and (3) an advanced IRB approach. Standardized approach is actually the same as under the original Basel Accord, but the risk weightings are based on the features of each borrower and provided by external credit rating firms, such as Standard & Poor's Corporation. The IRB foundation approach is a combination of internal and external estimates. The bank uses internal estimates of default probabilities but uses external estimates often provided by regulators for other inputs, such as loss given default (LGD). Under IRB advanced approach, the bank develops all of the estimates used in its models.

In order to measure credit risk, IRB banks calculate the expected loss (EL) represents the average loss in value from a risky asset over a specified time horizon. EL equals exposure at default (EAD) times default probability (PD) times the loss rate under default (LGD), the formula is:

$$\text{Expected Loss} = \text{Exposure at Default} \times \text{Probability of Default} \times \text{Loss Give Default.} \quad (1)$$

We can also get EL (%) by dividing EAD

$$\text{Expected Loss (\%)} = \text{Probability of Default} \times \text{Loss Given Default.} \quad (2)$$

The Basel II requires IRB banks to consider economic bad conditions and capture the relevant risks. The variation in expected loss is called the unexpected loss (UL). This method used to ensure that capital charges correctly reflect serious systematic volatility in credit losses over time, especially during economic downturn. And the regulators want guaranteeing sufficient capital to cover losses during adverse situations. Accordingly, the Basel committee includes the concept of unexpected losses (UL), which is:

$$ULEL = P\,[D=1|X=x_{0.999}] \times E\,[L|\,D=1,\, X=x_{0.999}] = CPD \times CLGD \quad (3)$$

Where CPD represents the conditional probability of default and CLGD represents the conditional loss given default. D is an indicator that is equal to one if an exposure defaults and zero otherwise.

The concept of Credit Value at risk (VaR) at a specific confidence level is applied. The notation

of probability of default conditional on 99.9% bad circumstances is $P[D=1|X=x_{0.999}]$. And notation of the loss given default conditional on 99.9% bad situation is $E[L|D=1,X=x_{0.999}]$.

The Basel II provides Asymptotic Single Risk Factor (ASRF) approach generated by Gordy (2003) to measure CPD:

$$\text{CPD} = \Phi\left(\frac{\Phi^{-1}(PD)+\sqrt{\rho}\cdot\Phi^{-1}(0.999)}{\sqrt{1-\rho}}\right), \quad (4)$$

where $\Phi(\cdot)$ represents the standard normal cumulative density function, $\Phi^{-1}(\cdot)$ represents the inverse of this function and ρ is the asset correlation.

Under this approach, correlations in realized losses across exposures were assumed to be driven by a single systematic risk factor capturing the effects of unexpected changes in economic conditions. Given the assumption of dependence, the loss rate for a well-diversified credit portfolio depended only on the systematic risk factor, not on idiosyncratic risk factors associated with individual exposures. The Basel II provides different weight to calculate asset correlation from different industry although the idea of asset correlation is to calculate the collation between the asset and the market, rather use real empirical data. For example, for corporate, sovereign, and bank exposures (Basel II 2006 drift):

$$\rho(PD) = 0.12\left(\frac{1-e^{-50\times PD}}{1-e^{-50}}\right)+0.24\left(1-\frac{1-e^{-50\times PD}}{1-e^{-50}}\right) = 0.24-0.12\left(1-\frac{1-e^{-50\times PD}}{1-e^{-50}}\right). \quad (5)$$

The Basel II developed the formula (5) and suggested that the relationship between asset correlation and default probability is negative. The relations will reduce the capital requirements when the economy is in the bad situation (see Lopez, 2002; Chernich et al., 2006). However, the specification in equation (5) contradicts studies that show that correlations are lowest for the highest quality, that is, high default probability firms (see Nickell et al., 2000; Servigny and Renault, 2002; Dietsch and Petey, 2004).

If asset correlation and default probability are positively correlated, both default probability and asset correlation will increase in recession periods, the banks will need to prepare more capital (see equation (4)), and cause further recession. Therefore, our study first tests the relationship between asset correlation and probability of default through our model.

II.2. The relationship between asset correlation and probability of default

The relation between asset correlation and probability of default is still unclear. Previous literatures have different suggestions on the relation. From the view of bank for international settlements (BIS), if their relation is negative, it can serve as automatic stabilizer. During boom periods, although the probability of default will decrease, the increase in asset correlation will require banks to provide more capital compare to negative relationship. Hence, the economic policy effect may more dominate than real world phenomenon.

Several studies support the negative relationships (see Lopez, 2002 and Chernich et al., 2006). Lopez (2002) uses one year cross-sectional data to calculate the average asset correlation $\overline{\rho}$. He documented that asset correlation is the decreasing function of default probability and increasing function of firm's asset size. Furthermore, empirical results indicate that the negative relationship between average asset correlation and default probability is significant for large firms. Chernich

et al. (2006) collects monthly asset returns from MKMV Credit Monitor between 1997 and 2006. Their results also indicate that the correlations increase as asset size increases and decrease as probability of default increases.

Previous study interprets why asset correlation and default probability are correlated (see Düllmann and Scheule, 2003). They use bank default data of German firms from 1987 to 2000 to estimate asset correlation. There are two arguments. One is time series argument: If the credit risk of a company increases, that is, increase in default probability, firm-specific risk factors dominate systematic risk and, therefore, the correlation with the systematic factor declines, which means, asset correlation will decline. Another argument is cross-sectional argument: firms that are more vulnerable to the business cycle may choose a safer capital structure in order to account for this higher risk. Because of the appropriate capital structure they have a lower probability of default. They do not find an unambiguous dependence on probability of default and asset correlation in their study.

In contrast, the positive relationship is observed by Servigny and Renault (2002). Their results indicate that asset correlation of non-investment grade companies is higher than investment grade companies. Nickell et al. (2000) suggests that the business cycle has a stronger effect and find that the volatility of low-graded obligors increases sharply in business cycle troughs, which implicates a higher correlation with the systematic factor. Dietsch and Petey (2004) examine the relation between asset correlation and default probability for median-size enterprises. Their data comes from the internal ratings systems from 1995 to 2001 in France and from 1997 to 2001 in Germany, and results indicate that asset correlation increase with default probability in Germany after controlling for size for different business sectors. But the relationship is U-shaped in France.

In short, the relation between asset correlation and default probability is still unclear, so we try to examine and provide some rational interpretations.

III. Methodology

III.1. Black and Scholes and Merton Model

The theoretic approach to corporate security valuation originated from the works of Black and Scholes (1973) and Merton (1973, 1974). Corporate securities have been viewed in terms of standard or non-exotic options written on the underlying assets of the firm. This basic insight has had a deep impact on financial theory and has produced a rich supply of empirically testable hypotheses. Based on this framework, equity value is viewed as a standard call option of corporate assets with a strike price that is equal to the promised payment of corporate liabilities. From their point of view, corporate security is a path-independent security since its payoff depends on the underlying asset value only at maturity, and not on the particular path followed up to maturity. Hence, default occurred only if the market value of the firm's assets is lower than that of its liabilities at maturity. At the end of the day, the market value of shareholder's equity V_E is

$$V_E = Max\left(V_A - D, 0\right)$$

where D is the debts of the firm. Following the Black-Scholes option pricing model, the value of the call option is given as follows:

$$V_E = V_A N\left(d_1\right) - e^{-rt} DN\left(d_2\right), \tag{6}$$

where V_E is the current market value of the firm's equity, V_A is the current market value of the

firm's assets, r is the risk-free interest rate, $e^{-rt}D$ is the present value of the future promised payment, t is the interval until the debt is paid back, $N(\cdot)$ is the cumulative distribution function for a standard normal random variable, and

$$d_1 = \frac{\ln(\frac{V_A}{D}) + (r + \frac{\sigma_A^2}{2})t}{\sigma_A \sqrt{t}},\ d_2 = d_1 - \sigma_A \sqrt{t}\ .$$

In order to derive the market value of the firm's assets V_A and the volatility of the firm's assets σ_A, we assume that the market value of the firm's equity follows a Geometric Brownian Motion,

$$dE = \mu_E E dt + \sigma_E E dZ\ , \qquad (7)$$

where μ_E is the expected continuously compounded returns on E, σ_E is the volatility of equity value, and dZ is the standard Weiner Process. Applying Ito's Lemma to this equation, the process for the firm's equity is

$$dE = \left[\frac{\partial E}{\partial t} + \frac{\partial E}{\partial V_A} \cdot (\mu_A V_A) + \frac{1}{2} \cdot \frac{\partial^2 E}{\partial V_A^2} \cdot (\sigma_A^2 V_A^2)\right] dt + \left[\frac{\partial E}{\partial V_A} \cdot (\sigma_A V_A)\right] dZ\ . \qquad (8)$$

We can get $\sigma_E E = \frac{\partial E}{\partial V_A} V_A \sigma_A$ from equation (7) and (8), and we know $\frac{\partial E}{\partial V_A} = N(d_1)$. Hence, we can derive the equation (9)

$$\sigma_E = \frac{V_A}{E} N(d_1) \sigma_A\ . \qquad (9)$$

Then, we can get V_A and σ_A of the firm by solving the equation (6) and equation (9). The initial value we put in will affect the result significantly when we do the linear program to solve the problem so we need to renew the initial value and get the smallest result. Next, we drive the probability of default of a specific firm according to the definition of Black-Scholes model. Assume that the firm's asset value V_A^T follows a lognormal distribution, and Geometric Brownian Motion (GBM). Therefore, the relationship between asset's value at maturity V_A^T and asset's value at initial date V_A^0 equals:

$$V_A^T = V_A^0 \cdot \exp\left\{\left(r - \frac{\sigma_A^2}{2}\right)t + \sigma_A \sqrt{t} Z\right\} \text{ where Z} \sim \text{N(0,1).}$$

Then, we take nature log in both sides

$$\ln V_A^T = \ln V_A^0 + \left(r - \frac{\sigma_A^2}{2}\right)t + \sigma_A \sqrt{t} Z$$

The probability of default at maturity occurs when the firm's value less than liabilities. So we can get the following equation:

$$PD_T = P\left[V_A^T < D\right] = P\left[V_A^T < \ln D\right] = P\left[\ln V_A^0 + \left(r - \frac{\sigma_A^2}{2}\right)t + \sigma_A \sqrt{t} Z < \ln D\right]$$

$$= P\left[\frac{\ln\frac{V_A^0}{D}+\left(r-\frac{\sigma_A^2}{2}\right)t}{\sigma_A\sqrt{t}} < -Z\right] = \Phi\left[-\frac{\ln\frac{V_A^0}{D}+\left(r-\frac{\sigma_A^2}{2}\right)t}{\sigma_A\sqrt{t}}\right] = \Phi(-d_2).$$

(10)

Under Black-Sholes-Merton Model, the results $\Phi(-d_2)$ can be viewed as probability of default. However, the formula in equation (10) is risk-neutral default probabilities measurement. Typically, since the underlying asset is risky, the use of risk-free rate is inappropriate. In the real world, we need to calculate the objective default probabilities. If we replace the risk-free interest rate with the expected return on the market value of the firm's asset, we will obtain the probability of default of the firm under an objective probability measure:

$$\Phi\left[-\frac{\ln\frac{V_A^0}{D}+\left(\mu_A-\frac{\sigma_A^2}{2}\right)t}{\sigma_A\sqrt{t}}\right].$$

(11)

III.1.2. Option-based Method for Asset Drift Estimation

In this section, we provide option-based method to estimate the drift term μ_A. By using equation (7) and (8), we can obtain

$$\mu_E E = \frac{\partial E}{\partial t} + \frac{\partial E}{\partial V_A}\cdot(\mu_A V_A) + \frac{1}{2}\cdot\frac{\partial^2 E}{\partial V_A^2}\cdot\sigma_A^2 V_A^2.$$

(12)

Then, we define sensitivity measures as the following:

$$EquityDelta\ \Delta^E = \frac{\partial E}{\partial V_A} = N(d_1)$$

$$EquityGamma\ \Gamma^E = \frac{\partial^2 E}{\partial^2 V_A^2} = \frac{n(d_1)}{V_A\sigma_A\sqrt{t}}$$

$$EquityTheta\ \theta^E = \frac{\partial E}{\partial t} = -\frac{V_A n(d_1)\sigma_A}{2\sqrt{t}} - rDe^{-rt}N(d_2)$$

where $n(x)$ is the cumulative standard normal distribution of x. These are similar to the standard sensitivity measures of a European call option. We put these option Greeks into equation (12), then solve μ_A:

$$\mu_E E = \theta^E + \Delta^E\mu_A V_A + \frac{1}{2}\Gamma^E\sigma_A^2 V_A^2$$

Hence, we get

$$\mu_A = \frac{\mu_E E - \theta^E - \frac{1}{2}\Gamma^E\sigma_A^2 V_A^2}{\Delta^E V_A}.$$

(13)

We get μ_E by dividing the firm's equity value at time t+1 by firm's equity value at time t, and then, we take the natural log, which is: $\mu_E = \ln(\frac{E_{t+1}}{E_t})$. However, there are several limitations on

Black-Sholes-Merton model.

First, we set the maturity of debt fixed in one year, and default only occurs when the debt mature, that is, we assumed that it is a European option contract. Paul and Turtle (2003) uses down and out barrier option pricing model to estimate the default probability. Second, Merton model consider that firm default only when the asset value is less than its total liability. KMV Corporation use lots of historical data and discover that when firm default, the value of asset is between the total debt and short-term debts. Hence they set the default point (DPT) equals to short-term debts plus half of long-term debts:

DPT: short-term debts + 1/2 long-term debts

KMV Corporation defines the distance-to-default (DD) as the number of standard deviations of asset value (V_A) away from default (DPT), then uses empirical data to decide the corresponding default probability. If we incorporate DPT in Merton Model rather use real data, we can obtain:

$$DD = \frac{V_A - DPT}{\sigma_A} = \frac{\ln(\frac{V_A}{DPT}) + (r - \frac{\sigma_A^2}{2})t}{\sigma_A \sqrt{t}}$$

Therefore, the probability of default in KMV model will be $N(-DD)$.

III.1.3. Asset Correlation

An important variable in the ASRF approach is asset correlation, the correlation of firm's assets with the common risk factor (see Gordy, 2003). Hence, the formula of asset correlation is:

$$\rho_{A,m} = \left(\frac{Cov(r_A, r_m)}{\sigma_A \sigma_m} \right)^2 . \quad (14)$$

We adopt Black-Scholes-Merton option pricing model and Capital Asset Pricing Model (CAPM) to obtain the individual asset correlation. From the previous analysis, the value of the common stock, E which is written on the value of the levered firm, V_A. Hence,

$$dE = \frac{\partial E}{\partial V_A} dV_A + \frac{\partial E}{\partial t} dt + \frac{1}{2} \frac{\partial^2 E}{\partial V_A^2} \sigma_A^2 V_A^2 dt . \quad (15)$$

Then, we divide by E on both sides and in the limit as dt approaches zero,

$$\lim_{dt \to 0} \frac{\partial E}{E} = \frac{\partial E}{\partial V_A} \frac{dV_A}{E} = \frac{\partial E}{\partial V_A} \frac{dV_A}{V_A} \frac{V_A}{E} , \quad (16)$$

where $\partial E / E$ is defined as the rate of return on the common stock, r_E, and $\partial V_A / V_A$ is defined as the rate of return on the firm's assets, r_A, therefore

$$r_E = \frac{\partial E}{\partial V_A} \frac{V_A}{E} r_A . \quad (17)$$

According to CAPM, we define

$$\beta_E = \frac{Cov(r_E, r_m)}{\sigma_m^2}, \ \beta_A = \frac{Cov(r_A, r_m)}{\sigma_m^2}. \quad (18)$$

By using equation (17) and (18), we can obtain

$$\beta_E = \frac{\partial E}{\partial V_A}\frac{V_A}{E}\frac{Cov(r_A, r_m)}{\sigma_m^2} = \frac{\partial E}{\partial V_A}\frac{V_A}{E}\beta_A. \quad (19)$$

From Black-Scholes-Merton option pricing model, we know that

$$\frac{\partial E}{\partial V_A} = N(d_1), \text{ where } 0 \le N(d_1) \le 1.$$

Then, we substitute this into equation (19) and we can obtain

$$\beta_A = \beta_E \frac{1}{N(d_1)}\frac{V_A}{E}. \quad (20)$$

We use equation (14), (18) and (20) to obtain

$$\rho_{A,m} = \left(\frac{Cov(r_A, r_m)}{\sigma_A \sigma_m}\right)^2 = \left(\beta_A \frac{\sigma_m}{\sigma_A}\right)^2 = \left(\beta_E \times \frac{1}{N(d_1)} \times \frac{E}{V_A} \times \frac{\sigma_m}{\sigma_A}\right)^2. \quad (21)$$

We get equity beta (β_E) form the following equation

$$\beta_i = \frac{Cov(R_m, R_i)}{Var(R_m)}.$$

where i: from firm 1 to firm i, t: from date 1 to date 255 (One year).

The main purpose of this study is to examine the relationship between asset correlation and probability of default so we describe how to test in the next section.

III.1.4. Test the Relations between Asset Correlation and Default Probability

The dependent variable of the regression is asset correlation, and independent variable is the risk-neutral default probability calculated from Merton model. Lopez (2004) suggests that the firm's size have positive impact on asset correlation so we include market value of assets to control the size effect. Furthermore, Dullmann et al. (2003) document that the industry effect is driven by size effect. That is, the firm size is different in each industry so if the firm size is controlled, the industry effect will disappear. Hence, the regression function is:

$$AC = b_0 PD + t_i YearDummy + b_1 LnSales + k_j IndustryDummy$$

We predict that the probability of default is negative to asset correlation and sales are positive to asset correlation. And we expect that industry effect still can explain the asset correction.

III.2. Data Description

We use a sample of UK firms for the period between 2000 and 2009, covering 10 years, and collect accounting data and return index using Datastream for firms in the non-financial corporate sectors such as aerospace and defense, alternative energy, automobiles and parts, beverages, chemicals etc.. We need several variables before employing Merton Option Pricing Model. To give an overview of the data, we provide summary statistics for those variables in

Table 1. In general, we get 759 observations from year 2000 to 1,291 observations in year 2009. Total sample equals to 10,865 over 2000 to 2009 periods. Market value of equity, volatility of equity returns, total liability, market value of assets and volatility of assets return are used to input into Merton model and betas are used to calculate asset correlation in our model. A further look into our data, it is reasonable that market value of equity, total liability and market value of asset are increase gradually and yearly volatility of equity returns are greater than volatility of asset returns.

III.2.1 Variables

Market value of equity (E) is the actual fiscal year-end closing price for a company's stock multiplying by the net number of all common shares outstanding at year end. The prices are adjusted for all stock splits and stock dividends occurring during the year. We collect return index (RN) using Datastream. Volatility of equity returns (σ_E) is calculated by annualized standard deviation of daily equity returns during the given year. We first calculate the daily log equity return, then measure its volatilities, finally multiply by the square root of 250. We exclude firms with return less than 100 daily observations each year. Total liabilities for the end (D) are collected from world scope of Datastream. Initial input value of market value of asset (V_A^0) is calculated by the sum of total liability and market value of equity at previous year end.

Table 1. Summary of statistics

Data are from Datastream from 2000 to 2009. We exclude financial institutions. To apply Merton's structural model, we need the following variables, market value of equity, volatility of equity, total debt, market value of assets and volatility of assets. The total observations are 10,865.

	Data types					
Year	Market Value of Equity (million)	Volatility of Equity Returns	Total Liability at Year End (million)	Market Value of Asset (million)	Volatility of Asset Returns	Observations
2000	23657.14	0.5650	959.66	23659.25	0.5645	759
2001	11197.22	0.5518	1186.74	11205.13	0.5496	879
2002	34959.96	0.5463	1745.67	34983.11	0.5409	783
2003	26412.78	0.5017	1644.93	26447.80	0.4868	839
2004	24418.26	0.4411	1622.57	24430.27	0.4371	939
2005	25869.14	0.4082	1597.25	25883.54	0.4057	1048
2006	26253.82	0.4567	1427.11	26263.60	0.4549	1259
2007	20373.32	0.3668	1343.85	20376.53	0.3663	1573
2008	4864.12	0.7781	1786.81	4870.58	0.7756	1495
2009	3430.98	0.9186	1892.21	5276.43	0.5883	1291
Average	20143.68	0.5534	1520.68	20339.63	0.5170	1087

To employ Merton model, we need the initial value market value of asset. We also need the initial value of volatility of asset returns (σ_A). We collect the previous five year market asset value, and then calculate the volatility of asset log return. Data we use need at least 3 year consequence asset value to derive their return of asset. In addition to previous 5 variables, we set the maturity date (T) equals to 1, which means that the promised future debt payment will be

due at 1 year. In this study, we need to calculate the beta (β) to get the asset correlation for each firm. The process is provided in section 4.2. We need at least 100 daily observations each year to calculate firm's return. The market return and risk free rate are also collected from Datastream.

Table 2. Estimation Results

We need risk-neutral default probability to calculate asset correlation. Basel II has set a range for corporate asset correlations from 8 to 24%, the exact value depending on several individual firm characteristics.

Year	Default Probability	Asset Correlation	Observations
2000	0.0002	0.0027	759
2001	0.0012	0.0441	879
2002	0.0046	0.0639	783
2003	0.0063	0.0538	839
2004	0.0049	0.0368	939
2005	0.0035	0.0384	1048
2006	0.0046	0.0550	1259
2007	0.0104	0.0792	1129
2008	0.0135	0.0802	1495
2009	0.1413	0.0492	1291
Average	0.0191	0.1180	1087

III.2.2 Merton Option Pricing Model

To obtain the suitable market value of assets and volatility of asset returns, we input collected data into Merton model, through linear programming. We solve the following two nonlinear equations:

$$F\left(\hat{V}_A, \hat{\sigma}_A\right) = E - V_A N(d_1) - e^{-rt} DN(d_2) = 0 ,$$

$$G\left(\hat{V}_A, \hat{\sigma}_A\right) = \sigma_E - \frac{V_A}{E} N\left(d_1\right)\sigma_A = 0 .$$

And find the value of $\hat{V}_A$ and $\hat{\sigma}_A$ to minimize:

$$\left[F\left(\hat{V}_A, \hat{\sigma}_A\right)\right]^2 + \left[G\left(\hat{V}_A, \hat{\sigma}_A\right)\right]^2 .$$

Finally calculate default probability from equation (10) and asset correlation from equation (21). Because some of our minima linear programming still very large, it may due to the divided range is not board enough, hence we exclude those observations. And we also exclude some observations that asset correlation is greater than 1 because asset correlation are bonded in 0 to 1 and some of the value are very huge, it will deviate most of our result. Table 2 provides the mean of programming result and the exclude percent are the observation percents that we will not analyze from Table 1. Since we just exclude a small percentage (about 1%), we think that it will not materially affect our results. On the other hand, we can roughly find that the negative relation on asset correlation and default probability. On average, years with higher asset correlation will

have lower probability of default; this result is consistent with Basel regulatory.

IV. Empirical Results

IV.1. Asset Correlation, Size Effect and Probability of Default

Previous study analyzes the relationship between size and asset correlation, the paper finds that asset correlation is positively related to firms' size but have a negative relationship with default probability and asset correlation in U.S., Japanese and European portfolios (Lopez, 2003). However, he only analysis this phenomenon in year 2000, hence we further discuss their time series relation. Trisection our sample in size and default probability each year in Table 3. We use sales as proxy for firm size and default probabilities are under risk-neutral world by Merton model. When firm's sales are less than 33% percentile of total observation each year, we sort it into "small" size. When it is more than 67% percentile of total observation, we sort it into "Big" size. Others we sort it in "Median" size. We also use the same methodology to sort our default probability. Results present in Table 3 and we find most of our outcomes are consistent with Lopez. Take year 2007 as example, when we control firms' size, we can find firms in low default probability will have higher asset correlation compare to firms in high default probability (from 0.0206160 to 0.2003368 in small size sub sample), in our 10 years data, most of big firms have such patterns. On the other hand, if we control firm default probability, it can be seen that firms in small size have lower asset correlation (from 0.2003368 to 2.2162229 in low default probability sub sample) and such patterns are significant in each year.

IV.2 Regression

To identify the relationship between asset correlation and probability of default as well as asset correlation and size, we use regression method to test their relations.

Table 3. Asset Correlation, Size Effect and Probability of Default

We act two-way sorting from 2000 to 2009. We trisection our sample based on risk-neutral default probability and firms' size. Market value of assets proxy for firms' size and default probability (PD) are obtained from Merton Model.

2000			
Size\PD	Low	Median	High
Small	0.0008	0.0017	0.0023
Median	0.0013	0.0018	0.0038
Big	0.0019	0.0051	0.0057

2001			
Size\PD	Low	Median	High
Small	0.0165	0.0278	0.0259
Median	0.0241	0.0319	0.0499
Big	0.0717	0.0733	0.0765

2002			
Size\PD	Low	Median	High
Small	0.0170	0.0205	0.0151
Median	0.0329	0.0439	0.0276
Big	0.1587	0.1535	0.0911

2003			
Size\PD	Low	Median	High
Small	0.0122	0.0120	0.0117
Median	0.0212	0.0248	0.0201
Big	0.1749	0.1089	0.0630

2004			
Size\PD	Low	Median	High
Small	0.0091	0.0125	0.0101
Median	0.0182	0.0237	0.0162

2005			
Size\PD	Low	Median	High
Small	0.0104	0.0134	0.0094
Median	0.0236	0.0277	0.0125

Big	0.1078	0.0697	0.0280
2006			
Size\PD	Low	Median	High
Small	0.0106	0.0122	0.0093
Median	0.0177	0.0325	0.0182
Big	0.1682	0.1144	0.0693
2008			
Size\PD	Low	Median	High
Small	0.0127	0.0162	0.0114
Median	0.0253	0.0455	0.0296
Big	0.1755	0.1913	0.1666
Average			
Size\PD	Low	Median	High
Small	0.02942	0.03117	0.01199
Median	0.05779	0.06132	0.02535
Big	0.33213	0.30355	0.09473

Big	0.1113	0.0641	0.0216
2007			
Size\PD	Low	Median	High
Small	0.2003	0.1908	0.0206
Median	0.3830	0.3660	0.0639
Big	2.2162	2.1325	0.3404
2009			
Size\PD	Low	Median	High
Small	0.0046	0.0046	0.0041
Median	0.0306	0.0154	0.0117
Big	0.1351	0.1227	0.0851

In Table 4, we use asset correlation as dependent variable and probability of default, firm size as independent variables. Since our dependent variables are bounded between zero and one, we also use the inverse logistic function, which is $ILnAC = Ln\left(AC/(1-AC)\right)$ in Model 3 and Model 4. This transformation will cause the dependent variable more like regression model's assumption. Notice that, because most of our value of asset correlations are less than 0.5, through logistic function transformation, the value will less than zero. We use risk-neutral default probability as dependent variable (see Table 4). From previous analysis, we observe that size may have to do with asset correlation.

Table 4. Regression Results

Main results of the estimation of the equation for asset correlation from period 2000 to 2009, p-value in brackets, we also use the inverse logistic function, which is $ILnAC = Ln\left(AC/(1-AC)\right)$ as dependent variable. PD is Probability of default, and we take natural log of sales proxy for firms' size. Some of models also control for industry dummy. R represents the R-square of model and R-adj is the adjective R-square.

	Model 1	Model 2	Model 3	Model 4
Dependent variable				
AC	✓	✓		
ILnAC			✓	✓
Independent variable				
Intercept	0.07324	-0.83991	-4.80966	-10.5496

	(<.01)	(<.01)	(<.01)	(<.01)
PD	-0.18096	0.070167	-3.51885	-1.97227
	(<.01)	(0.2386)	(<.01)	(<.01)
LnSales		0.071847		0.451951
		(<.01)		(<.01)
R-adj	0.1220	0.1755	0.1131	0.2534
Observations	10865	10865	10865	10865

Therefore, we need to control that variable in our regressions. Furthermore, we take natural log of market value of assets as proxy for firms' size and we also add year dummy in each regression. In Table 4, we can understand from our regression that the risk-neutral probability of default is negatively related to asset correlation, most of them are significant at 0.01 levels. Further, we find that asset correlation is positively related to market value of assets.

V. Conclusions

It is crucial to have a global institution to supervise international banks in a globalized world and this is the main function of the bank of international settlements (BIS). If the formulas of capital charges provided by Basel II are not correct, it may have negative impact on deposits. BIS set the negative relation on asset correlation and default probability, however, their direction do not always negative from previous literatures. In our study, we use Merton model to calculate risk-neutral default probability, and we employ capital asset pricing model (CAPM) to compute asset correlation. We use a sample of UK data over 2000 to 2009 periods. We observe that the model is consistent with regulation for credit risk provided by Basel committee. Asset correlation is a negatively related to probability of default but a positively related to firms' size.

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A mediating role of debt level on the relationship between determinants of capital structure and firm's financial performance

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Abstract

Purpose: This research attempts to investigate whether the link between the determinants of capital structure and a firm's performance exists in the UK context, and whether debt level plays a mediating role in such a relationship if it exists. In addition, we run F test according to Schroeder, Sjoquist, and Stephan (1986) which investigates the significance of the difference between two R-squares in two different models.

Methodology: this study uses panel data models (OLS, fixed effect and random effect) for fifteen years period from 1992 to 2006. The sample consists of 425 non-financial firms represent the FTSE All-Share Index published by the Financial Times and London Stock Exchange.

Findings: First, results show that debt level has a significant mediating role for the relationship between determinants of capital structure and the financial performance, this role is weak but still significant in all regressions. Second, there is a direct and significant relationship between assets structure, growth opportunities, non-debt tax shields firm's risk and liquidity on one hand, and firm's financial performance on the other hand. Third, results reveal negative and significant relationship between debt level and firm's financial performance. Fourth, this research confirms the previous studies that assets structure, growth opportunities, firm's profitability, firm's size, firm's liquidity and industry type are important determinants of capital structure. Moreover, all above relationships have been controlled for firm's size and industry type.

Originality/ value: Several important contributions of this study that advance the knowledge in the area of capital structure and performance. First, this is the first comprehensive study examining the relationship between determinants of capital structure, debt level, and a firm's financial performance for the UK capital market from the perspective of capital structure theories. Second, this is the first study to test and prove the mediating role of debt level in the relationship between determinants of capital structure and a firm's financial performance. Third, choosing a performance measure that represents the shareholders' value represents a real challenge; this study picks four performance measures which represent the point of view of shareholders. Fourth, this is the first study to prove that there is a relationship between assets structure, liquidity and non-debt tax shields on one hand, and firm's financial performance on the other.

Keywords: capital structure, debt level, firm performance.

I. Introduction

The relationship between debt level and firm's performance is an important unsolved issue in the finance field. Reasonable theoretical as well as empirical studies try to define the determinants of capital structure. However, research investigating the relationship between debt level and firm's financial performance as well as the important role of these determinants of capital structure on financial performance is limited. Also, there is no previous studies investigate the mediating role of debt level in this relationship. Therefore; this research attempts to fill in this gap.

Assuming that the debt level is determined by a number of factors which called in this research the "determinants of capital structure"; and the debt level influence the firm's financial performance; then it is reasonable to expect that determinants of capital structure would also influence the firm's financial performance. Consequently; this research aims to answer these questions empirically:

- What are the most important determinants of a firm's capital structure in the UK capital market?
- What is the relationship between debt level and a firm's financial performance in the UK capital market?
- What is the relationship between the determinants of capital structure and a firm's financial performance in the UK capital market?
- Is there any mediating role for the debt level for the relationship between the determinants of capital structure and a firm's financial performance in the UK capital market?

First question is covered empirically by previous studies, so this research will only present any differences for the results of this relationship, and emphasize on the last part of the questions.
The remainder of this paper is organized as follows; the next section briefly reviews prior capital structure literature. Section three explains the empirical capital structure studies. Section 4 discusses the research methodology. Section 5 presents a discussion of research results. Finally, section 6 concludes the study with a discussion, conclusions, implications and future recommendations.

II. Literature Review

The issue of capital structure is concerned with the optimum mix of debt and equity in the financing structure. This optimal capital structure concludes in minimum weighted average cost of capital, and consequently maximizes the firm's performance in terms of shareholders' value.
Modigliani & Miller (1958) theory leads the way to the theory of capital structure. This theory reveals that in a perfect world[17], the debt level in the firm's capital structure has no impact on the firm's performance. Following this work, capital structure mainly depends on theories that include corporate taxes, financial distress, agency costs, trade-off and signalling.
The agency problem is considered an important issue in most industries due to the separation of ownership and control. This may result in insufficient work efforts by managers which makes them more interested in their personal perquisites, or choose policies that suit their own preferences, and as a result fail to maximize the firm's shareholders' wealth. Debt level is used to control the managers' opportunistic behaviour by reducing the free cash flows in their hands and constrain or encourage them to act more in the shareholders' interest. Also, debt level prevents the investment in negative projects by committing the management to pay fixed interest payments.
However, managerial ownership and compensation systems are considered good mechanisms that align the interests of managers and shareholders. This motivates managers to take actions that maximize the firm's performance and consequently the shareholders' wealth.
The asymmetric information model assumes that managers generally have better information about their firm's than outside investors. Well-informed insiders tend to convey the firm's positive information to the poorly informed outsiders to enhance the firm's performance. According to the signalling theory, managers have clear incentives to use signals to differentiate their firm from weaker competitors. One of the important signals employed in this concern is the use of debt. Debt signals good news and means that managers are confident about the firm's future which followed by the firm's superior performance. However, equity signals bad news

[17] The perfect world is a world with no taxes, perfect and credible disclosure of information, and no transaction or agency costs

and possibly means that earnings will fall in the future which indicates poor performance.
Trade-off theory by (Miller 1977) states that the firm has an incentive to use debt and will continue to do so until their additional supply drives up interest rates to the point where the tax advantages of interest deduction are completely offset by higher rates. In other words, the firm will use the debt until the optimal level of debt is reached. This level occurs by trading-off between benefits and costs of using debt. Theoretically, the appropriate capital structure mix minimizes a firm's cost of capital which consequently maximizes the firm's performance. Managers who are willing to recognize and maintain this appropriate mix minimize financing costs and improve their firm's performance.

III. Empirical capital structure studies and research hypotheses

This section has been divided into four sub-sections according to the relationships investigated.

1. Determinants of capital structure and debt level:

Regarding the determinants of capital structure and debt level, this field is well investigated in previous studies like Ozcan 2001; Bevan and Danbolt 2002; Beattie et. al. 2006. However, this research will consider any differences in the results according to the following hypotheses. The proposed relationships are well explained in capital structure theories.

H1-1: There is a positive relation between assets' tangibility and debt.
H1-2: There is a negative relation between growth opportunities and debt.
H1-3: There is either a negative or positive relation between profitability and debt.
H1-4: There is either a negative or positive relationship between a firm's size and debt.
H1-5: There is either a negative or positive relationship between risk and debt.
H1-6: There is a negative relationship between non-debt tax shields and debt.
H1-7: There is either a negative or a positive relationship between liquidity and debt.

2. Capital Structure and Firm Performance

Meanwhile (Krishnan & Moyer 1997), (Phillips & Sipahioglu 2004), and (Murphy 1968) find no significant relationship between debt level and firm's performance; (Singh & Faircloth 2005), (Forbes 2002), (Gleason, Mathur, & Mathur 2000), (Chang Aik Leng 2004), (Omran, Atrill, & Pointon 2002), and (Carleton & Silberman 1977) find a negative relationship. On the other hand (Berger & Bonaccorsi di Patti 2006) and (Dessi & Robertson 2003) find a positive and significant relationship. However, (Thompson, Wright, & Robbie 1992), (Campello 2006), (Welch 2004) find conflict results. Therefore, the researcher hypothesizes that debt level influence the firm's financial performance as follows

H2: Debt level influences the firm's financial performance.

Moreover, firm's size as a control variable may affect the relationship between debt level and firm's financial performance. This is supported by (Gleason, Mathur, & Mathur 2000), (Simerly & Mingfang 2000), (Omran, Atrill, & Pointon 2002), (Chang Aik Leng 2004), (Berger & Bonaccorsi di Patti 2006), (Dessi & Robertson 2003), (Krishnan & Moyer 1997), and (McKean & Kania 1978).
Also, for the effect of the industry type for this relationship, trade-off theory assumes that firms in the same industry should have the same capital structure since each has the same assets, business risk and profitability. (McKean & Kania 1978) find that profit performance differs

significantly by industry. Gleason, Mathur, & Mathur (2000) confirm that industry concentration is not significant.

3. Determinants of capital structure and financial performance

The trade-off theory suggests an optimal capital structure mix for a firm to achieve the minimum cost of capital of financing. Theoretically, the expected minimum cost of capital should reflect the maximum financial performance and maximum welfare of shareholders. This is important for financial management in that, if the determinants of capital structure do not lead to the increase of the firm's performance, there is no need for financial managers to search for those determinants. The following hypotheses test whether the determinants of capital structure directly affect the financial performance.

To the researcher's knowledge, there are no previous researches relating the determinants of capital structure directly with the financial performance in terms of shareholders' value from the perspective of capital structure theories for the UK capital market for the study period. Therefore, this research will propose such a relationship between each determinant and the firm's financial performance.

1. Assets structure

Apart from (Shergill & Sarkaria 1999), there are no studies testing the assets structure and its relationship with performance. Therefore, it is worthwhile to investigate this relationship for this study sample due to the effect described by the trading-off theory.

Trade-off theory assumes that firms with high tangible assets are stronger to face financial distress; because of their liquidation value, these assets are considered as productive resources, this would speed up the production process as well as improve the quality of product, and then improve the financial performance. Also, firms which have tangible assets have a good reputation in getting funds since tangible assets are used as a guarantee for external debt. These funds are used in profitable projects that result in higher performance. Therefore, trading-off assumes a relationship between tangibility and performance as represented in the following hypothesis:

H3-1: There is a relationship between assets' tangibility and the firm's financial performance for the UK capital market.

2. Growth opportunities

Trading-off theory considers growth opportunities as an indicator for the firm's success; these firms are stronger to face financial distress. Firms with good growth opportunities have a good reputation in getting funds, easier access to the finance market, and this could be reflected in better performance for these firms.

According to the agency theory perspective, firms with high growth opportunities have lower agency costs. Firms with greater growth opportunities might have lower debt ratios due to the fear of debt-holders that firms may forgo valuable investment opportunities and expropriate wealth to their benefit, and this outcome would be reflected in lower agency costs.

Also, agency theory assumes that growth opportunities enlarge managers' power. This can be treated as an advantage for the company in that these managers use this power to enlarge the firm's performance, although they increase their own wealth at the same time.

According to the above discussion, capital structure theories assume a relationship between growth opportunities and performance as represented in the following hypothesis:

H3-2: There is a relationship between growth opportunities and the firm's financial performance for the UK capital market.

3. Firm's size

Trading-off theory assumes that large firms are more diversified, more to use economies of scale production, have greater access to new technology and cheaper sources of funds, and also investors believe that large companies are less risky. This suggests a positive relationship between size and performance. On the other hand, there is an argument supported by many studies that a firm's size does not reflect its performance and small firms are more productive than the large firms. In addition, many studies find no relationship support the proposition that the competitive advantages among firms are their products and technology, and not the size of the firm. In this research we consider the trading-off theory and assume a relationship between the firm size and financial performance as represented in the following hypothesis:

H3-3: There is a relationship between the firm's size and the firm's financial performance for the UK capital market.

4. Firm's risk

According to the agency theory, the required return of investors should be suitable to their risk in the firm. Shareholders will require high return in order to hold the risk related to the bankruptcy and financial distress since the debt-holders have the priority in the case of bankruptcy. Also, the debt-holders will require such return to hold the risk of agency conflicts with shareholders and management. This will encourage the managers to maximize their performance in order to fulfill the requirements of these investors, which may indicate a relationship between firm's risk and performance as represented in the following hypothesis:

H3-4: There is a relationship between risk and the firm's financial performance for the UK capital market.

5. Non-debt tax shields

According to the trade-off theory, the main advantage of NDTS is the tax savings which have been obtained by the use of debt. These savings may have been used in profitable projects which may indicate a relationship between NNDTS and the firm's performance. However, more NDTS reduce the benefits of the tax shields from the use of the debt and consequently may indicate a negative relationship with the performance. There are no previous studies in regards to the non-debt tax shields and their effect on the financial performance. Therefore, it is worthwhile to investigate this relationship for this study sample as represented by the following hypothesis:

H3-5: There is a relationship between non-debt tax shields and the firm's financial performance for the UK capital market.

6. Firm's liquidity

According to the trade-off theory, high liquidity position for the firm's indicates that this firm is strong enough to face any short or long-term financial problems; this strong firm can perform better than a weak firm which has week liquidity position in its financial statements. This may indicate a relationship between a firm's liquidity and the financial performance as stated by the following hypothesis:

H3-6: There is a relationship between liquidity and the firm's financial performance for the UK capital market.

3. The mediating role of debt

It is expected for the debt level to have a mediating role between determinants of capital structure and the firm's financial performance according to the following hypothesis.

H4: Debt mediates the relationship between determinants of capital structure and firm's financial performance

Testing the mediating role of a variable (M) between an independent variable (X) and dependent variable (Y) is tested following the criteria suggested by (Baron & Kenny 1986) and (Miles & Shevlin 2001). Following these procedures, a series of analyses were conducted to test whether debt level mediates the relationship between determinants of capital structure and firm's financial performance.

Three conditions should be met in testing the mediating role of debt level (M) for the direct relationship between determinants of capital structure as independent variables (X) and firm's financial performance as a dependent variable (Y). First relationship is between the (X) and (M) should be significant. Second relationship is between (M) and (Y) should be significant. Third relationship between (X) and (Y) directly also should be significant. However, in case of a complete mediating role, the effect of determinants of capital structure (X) on firm's financial performance (Y), when controlled for capital structure (M) should be zero. However, in the case of partial mediator, the relationship between (X) and (Y) will be reduced.

IV. METHODOLOGY

IV.1 Data

Most of the data used in this study are collected from secondary sources. The main source of the research data is the DataStream database which contains published accounts data. This database contains balance sheet, profit and loss, and cash flow statement information for companies in the majority of countries.

IV.2 Research Sample

This research covers the period for fifteen years from 1992 to 2006. It deemed necessary to select long period in order to draw sound statistical estimations for relationships assigned to be tested in this research. Since it is not expected that each firm have the same number of time series observations among panel members, this panel data is unbalanced panel. The final sample consists of 425 UK listed non-financial firms represent the FTSE All-Share Index published by the Financial Times and London Stock Exchange.

FTSE All-Share Index is considered the most recent constituent list. It is the aggregation of the FTSE 100, FTSE 250 and FTSE SmallCap Indices. FTSE provides details of all companies that are currently constituents of their FTSE All-World index. FTSE World stock-level data, including constituent lists, provide daily, monthly, and yearly data for Europe, Americas, and Asia Pacific.

The FTSE All-Share Index is a market-capitalization weighted index representing the performance of all eligible companies listed on the London Stock Exchange's main market, which pass screening for size and liquidity. Today, the FTSE All-Share Index covers 693 firms with a combined value of nearly £2 trillion (as at April 2007) – approximately 98-99% of the UK's market capitalization. The FTSE All-Share Index is considered to be the best performance measure of the overall London equity market with the vast majority of UK-focused money invested in funds which track it. The FTSE All-Share Index also accounts for 11.58% of the

world's equity market capitalization (as at April 2007) (FTSE 2008)
The final sample is 425 companies after excluding eight firms due to the unavailability of its data in the database. Moreover, this study uses the Stata to test the study relationships. Stata can be applied for panel data studies and it gives the related tests which are not available in other software packages.

IV.3 Transformation of variables

Because of the data type in such researches, there are no borders of firm's figures. Kolmogrov-Smirnov test of normality statistic for large samples (n > 2000) is tested for this research sample and it shows a violation of the normal distribution. In such situation data transformation is required. However, the study proves that the transformed sample set is better than the original sample which may gives misleading results. Also, transformation method uses the whole observations available in the sample. Therefore, we transform the data of the research variables before implement the statistics methods to test the study's hypotheses.
When variables are found to shown non-normality, steps are taken to manipulate these variables. Different types of transformation techniques are utilized, namely normal scores using Van der Waerden proportion estimated formula, log odds ratio, and simple ranking. This study uses the Van der Waerden's method (Conover 1999):

$$s = \Phi\left(\frac{r}{n+1}\right)$$

Where:
s: normal score for an observation,
r: the rank for that observation,
n: is the sample size, and
Φ (p): the (p)'th quantile from the standard normal distribution.

IV.4 Research Models

Four relationships have been tested in this research. In the first relationship; debt level represents the dependent variable, and the determinants of capital structure are the independent variables. Second relationship investigates the relationship between debt level as independent variable and firm's financial performance as dependent variable. Third relationship investigates the direct relationship between capital structure determinants as independent variables and firm's financial performance as dependent variable. Finally; the fourth relationship investigates the effect of inclusion of debt level as a mediating variable; so debt level in addition to all determinants of capital structure, regardless the relationships defined in the first relationship, is regressed on the financial performance as dependent variable.
Moreover; literature generally recognizes additional control variables for the above relationships. Industry type is a dummy variable is included for the above relationships, and firm's size is considered as a control variable for the second relationship only. However; excluding firm's size from other relationships is due to the inclusion of firm's size as an explanatory variable to prevent any multicollinearity.
Research models can be summarized as follows:
debt = x0+ x1 ppe+ x2 rvgth+x3 tsq+x4 mrg+x5 ebitd+ x6 lgta+x7 s.div+ x8 dda+ x9 c.rt+ x10 dvind
per = x0+ x1 debt+ x2 dvind+ x3 dvsize
per = x0+ x1 ppe+ x2 rvgth+x3 tsq+x4 lgta+x5 s.div+ x6 dda+x7 c.rt+ x8 dvind
per = x0+ x1 ppe+ x2 rvgth+x3 tsq+x4 lgta+x5 s.div+ x6 dda+x7 c.rt+ x8 dvind+ x9 debt

Where:
X0: Constant
X1,2,3…10: Coefficients
debt: total debt to total capital, long-term debt to total capital measured by both book value and market value
ppe: assets structure represented by property, plant and equipment to total assets
rvgth: annual growth in total sales
Tsq: Tobin's Q measured by market value of equity plus book value of debt divided by book value of equity and debt
mrg: net profit margin, net income available for common stockholders over sales * 100%
ebitd: earnings before interest and taxes to total assets
lgta: logarithm of total assets
s.div: standard deviation of the annual percentage change in earnings before interest and taxes to total assets
dda: non-debt tax shields, ratio of total annual depreciation, depletion and amortization to total assets
c.rt: current ratio, current assets to current liabilities
dvind: industry as a dummy variable, 1 if industrial, 0 non-industrial
dvsize: firm size as a dummy variable, represented by logarithm of total assets, 1: large firms; 0: small firms
per: financial performance, represented by return on investment, return on equity, price to earnings ratio, economic value added.

IV.5 Model specifications tests

To choose between fixed effect models (FEM) and Pooled depending on the (F-test), the researcher concludes that the fixed group effect model is better than the pooled OLS model in all relationships done in this research. Furthermore; depending on Breusch-Pagan Lagrange Multiplier (LM) test to choose between random effect models (REM) and Pooled the researcher concludes that random effects method is appropriate and better than the pooled method for all relationships made in this research. Finally, depending on the probability of chi2 for the Hausman test, the researcher accepts the alternative hypothesis for all relationships which indicates a correlation between the individual effects and regressors (xit). In this case Hausman specification test confirmed the superiority of the fixed effect model over the random effect model.

V. EMPIRICAL RESULTS

V.1 Descriptive analysis

It is clear that the normality distributions of the majority of variables are violated before the data transformation. The p value of Kolmogorov-Smirnov before transformation is (0.000), but after transformation it gives the value of (0.200). This violation is approved by the Skewness and Kurtosis values. However, debt measures indicate violation of the normality assumption. This is due to the presence of many non-missing zero values in these variables. In other words, many values concentrated around a specific point. These non-missing zeros are important in the overall objectives of this study, therefore the researcher does not have a choice to isolate or delete these figures. The following table summarizes descriptive statistics for all variables.

Descriptive Statistics

Abbreviation	Description	Observations	Min	Max	Median	Mean	Std. Deviation	CV[18]
ppe	Property, Plant And Equipment	4,993	0.000	0.960	0.279	0.330	0.250	0.760
rvgth	Net Sales or Revenues	4,212	-0.320	0.530	0.079	0.090	0.150	1.670
tsq	Tobin's Q	4,153	0.002	486.710	135.434	160.050	105.190	0.660
mrg	Net Margin	4,310	-9.900	21.890	5.360	6.080	5.610	0.920
ebitd	Earnings Before Interest, Taxes & depreciation	4,507	-7.990	35.000	14.268	14.700	7.890	0.540
lgta	Log of Total Assets	4,943	3.300	7.740	5.450	5.500	0.790	0.140
sdiv	Standard deviation of EBITD	4,024	0.000	9.990	1.698	2.510	2.360	0.940
dda	Depreciation, depletion & amortization	4,732	0.000	0.110	0.039	0.040	0.020	0.500
crt	Current Ratio	4,592	0.130	2.990	1.230	1.290	0.540	0.420
tdbv	Book value of Total debt	4,795	0.000	103.540	28.180	29.400	22.720	0.770
tdmv	Market value of Total debt	4,335	0.000	103.550	16.401	23.390	23.530	1.010
ldbv	Book value of Long Term Debt	4,813	0.000	103.630	18.856	22.600	22.350	0.990
ldmv	Market of Long Term Debt	4,443	0.000	103.820	9.563	17.770	21.630	1.220
ROI	Return On Invested Capital	4,669	0.000	18.490	11.800	12.800	4.480	0.350
ROE	Return On Equity	4,125	-13.900	38.990	15.400	16.200	9.350	0.580
PE	Price/Earnings Ratio	3,930	-20.600	52.800	15.000	16.100	13.080	0.810
EVA	Economic value added	387	-592259	3789497	4463.165	58137.77	324209.50	5.580
1-SAL%	Other benefits given to the CEO: 1 minus basic salary	294	0.000	0.920	0.398	0.400	0.010	0.030
TSSno.	number of total major shareholders who own more than (3%)	276	0.000	13.000	5.000	5.080	0.172	0.030

[18] CV = Standard deviation/ Mean
CV is the coefficient of variation. It is a more uniform method of determining the relevance of the standard deviation. The closer the CV is to 0, the greater the uniformity of data. The closer the CV is to 1 or more than 1, the greater the variability of the data (Field A. 2005).

Assets structure

The first variable is the assets structure (assets tangibility), proxied by property, plant and equipment to total assets. The mean is 0.334 and median 0.279. The fixed assets to total assets for the sample are ranged from 0 which means no fixed assets in these firms to 0.955 expresses that 95.5% of a firm's assets are fixed assets with low standard deviation 0.249 and coefficients of variation 0.76. Unexpectedly, it has been noticed that industrial firms have less fixed assets (29%) than non-industrial firms (36%).

Growth opportunities

The second variable is the growth opportunities which have been measured by two proxies, growth in total sales and Tobin's Q. For the first proxy (growth in total sales), the mean is 0.094 and median 0.079, growth in total sales for the sample are ranged from -0.320 to 0.528 with a standard deviation of 0.154 and coefficients of variation of 1.667, skewness of this variable is 0.001 and kurtosis is -0.037. For the second proxy (Tobin's Q), the mean is 160.052 and median is 135.433, Tobin's Q for the sample are ranged from 0.002 to 486.713 with a high standard deviation of 105.191 but a low coefficient of variation of 0.657

Firm's profitability

The mean for the net profit margin is 6.079 and median is 5.360 with a standard deviation of 5.605 and coefficient of variation of 0.923; net profit margin for the sample is ranged from -9.900 to 21.890; skewness of this variable is 0.000 and kurtosis is -0.032. For the second proxy (EBITDTA), the mean is 14.698 and median is 14.268 with a standard deviation of 7.887 and coefficient of variation (CV) of 0.537; the firms in the sample are ranged according to basic earnings power from -7.992 to 34.998

Firms' size

The fourth variable is the firms' size which is represented by the logarithm of total assets. The mean of this variable is 5.504 and median is 5.450 with a low standard deviation of 0.794 and low coefficient of variation 0.144. Logarithms of total assets for the sample are ranged from 3.303 to 7.742. Skewness of this variable is 0.000 and excess kurtosis is -0.032.

Firm's risk

The fifth variable described here is the firm's risk, which is presented by the volatility of the firm's earnings. The volatility of earnings increases the probability of financial distress and bankruptcy costs. The mean of this variable is 2.509 and the median is 1.698 with a low standard deviation of 2.356 and a low coefficient of variation of 0.940. Firms vary in adopting risk; for the study sample, risk is ranged between 0.000 to 9.990, skewness of this variable is 0.000 and excess kurtosis is -0.033.

Non-debt tax shields

The sixth variable is the non-debt tax shields proxied by the ratio of total annual depreciation, depletion and amortization to total assets (DDATA). The higher the non-debt tax shields, the lower the potential tax benefits of debt. The mean of this variable is 0.042 and median is 0.039 with a standard deviation of 0.023 and a coefficient of variation of 0.50. Firms vary in their ratios of non-debt tax shields; they are ranged between 0.000, which means the firms do not have any non-debt tax shields, to 0.110, which considers also small ratio; the skewness of this variable is 0.007 and excess kurtosis is -0.056.

Firm's liquidity

The mean of this variable is 1.291 and median is 1.230 with a standard deviation of 0.542 and a coefficient of variation of 0.419. Firms vary in their current ratios; they are ranged between 0.130 to 2.990; the skewness of this variable is 0.000 and excess kurtosis is -0.033.

Debt level

The average of the debt in the whole sample is 23.67 for the four values of debt and the average of the medians is 18.250 with an average standard deviation of 22.56 and an average coefficient of variation of 0.996. Debt levels for the sample ranges from zero to 103. Skewness and Kurtosis are acceptable for the normal distribution as is shown in table 6.5 before. The majority of the sample members (90%) have debt ratios less than 50% (average of debt using all ratios) in their capital structure. The following table shows another classification for the debt averages. Using the normal distribution limits, the following table shows the concentration of the debt levels among the study sample.

Debt categories

Debt Average categories	Frequency	Percent
< = 9	66	0.16
> 9 - < = 26	166	0.40
> 26 - < = 42	122	0.29
> 42	66	0.16
Total	420	1.00

Financial performance

For the financial performance variables, the overall average is 15% with an average median of 14.067, an average of standard deviation of 8.97, and an average coefficient of variation of 0.580. Meanwhile, ROE ranges between 0.000 and 18.494, ROI ranges between 13.900 and 38.990, but PE has a wider range between -20.600 and 52.800. Skewness and kurtosis values for performance measures are acceptable to reflect normal distribution.

For the Economic value added (EVA), the mean is 58137 and median is 4463, while EVA ranges from -592258 to 3789497 with a standard deviation of 324209. This value seems to be high; however, the coefficient of variation for EVA is 5.577. Skewness and Kurtosis values for EVA are acceptable. The negative figures for EVA are because of the low net income which is the first figure in the EVA equation. However, one of the limitations of this study is the calculating of EVA as was discussed earlier.

V.2 Regression results

The results of static panel data models for the first relationship confirm that assets structure and firm's size have a significant positive relationship with the firm's debt level using different measures. On the other hand, growth opportunities, profitability, and liquidity have significant negative relationship with the firm's debt level. However, the research shows contradict results for firm's risk and non-debt tax shields. In addition, we find that industry has a positive and significant relationship with the debt level (Table 1-1 to 1-8)

Panel data analysis results

Relationship 1: Determinants of capital structure and debt level

Table 1-1 Regression results of assets structure and debt level

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
tdbv	0.0013	0.936	0.064	0.018	0.0683	0.002
tdmv	0.099	0.000	0.103	0.000	0.118	0.000
ldbv	0.069	0.000	0.175	0.000	0.144	0.000
ldmv	0.144	0.000	0.220	0.000	0.197	0.000

Table 1-2 Regression results of growth opportunities (Tobin's Q) and debt level

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
tdbv	-0.088	0.000	-0.074	0.000	-0.080	0.000
tdmv	-0.541	0.000	-0.403	0.000	-0.446	0.000
ldbv	-0.099	0.000	-0.073	0.000	-0.083	0.000
ldmv	-0.450	0.000	-0.308	0.000	-0.350	0.000

Table 1-3 Regression results of profitability (profit margin: mrg) and debt level

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
tdbv	-0.137	0.000	-0.101	0.000	-0.107	0.000
tdmv	-0.115	0.000	-0.096	0.000	-0.098	0.000
ldbv	-0.092	0.000	-0.083	0.000	-0.088	0.000
ldmv	-0.072	0.000	-0.091	0.000	-0.090	0.000

Table 1-4 Regression results of firm's size and debt level

lgta	Pooled OLS:		Fixed effects		Random effects	
tdbv	0.203	0.000	0.112	0.000	0.148	0.000
tdmv	0.184	0.000	0.177	0.000	0.186	0.000
ldbv	0.300	0.000	0.372	0.000	0.348	0.000
ldmv	0.259	0.000	0.381	0.000	0.333	0.000

Table 1-5 Regression results of firm's risk (standard deviation of annual income) and debt level

sdiv	Pooled OLS:		Fixed effects		Random effects	
tdbv	0.002	0.908	-0.004	0.708	-0.003	0.786
tdmv	0.000	0.986	-0.004	0.609	-0.004	0.584
ldbv	0.003	0.822	-0.002	0.835	-0.001	0.908
ldmv	-0.001	0.938	-0.002	0.800	-0.003	0.745

Table 1-6 Regression results of non-debt tax shields and debt level

dda	Pooled OLS:		Fixed effects		Random effects	
tdbv	-0.013	0.430	0.044	0.022	0.031	0.080
tdmv	-0.032	0.014	0.000	0.981	-0.012	0.418
ldbv	0.029	0.083	0.055	0.006	0.047	0.011
ldmv	0.006	0.648	0.002	0.908	-0.001	0.930

Table 1-7 Regression results of Liquidity and debt level

crt	Pooled OLS:		Fixed effects		Random effects	
tdbv	-0.413	0.000	-0.347	0.000	-0.360	0.000
tdmv	-0.236	0.000	-0.211	0.000	-0.218	0.000
ldbv	-0.221	0.000	-0.042	0.023	-0.080	0.000
ldmv	-0.113	0.000	0.041	0.008	0.005	0.718

Table 1-8 Regression results of Industry and debt level

Dependent variable	Coef.	P>z
tdbv	0.211	0.005
tdmv	0.209	0.000
ldbv	0.117	0.118
ldmv	0.135	0.022

Relationship 2: debt level and the firm's financial performance

Regarding the second relationship, the panel results in all three methods pooled (OLS), fixed and random effect models reveal a negative and significant relationship between debt level and the firm's financial performance. In addition, we find that firm's size has a positive and significant relationship with firm's financial performance. However, industry type has an unclear role (Table 2)

Table 2 Panel data analysis results- Relationship 2

	Fixed effects						Random effects					
	ROI		ROE		PE		ROI		ROE		PE	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
tdbv	-0.248	0.000	-0.172	0.000	-0.112	0.000	-0.209	0.000	-0.323	0.000	-0.120	0.000
tdmv	-0.453	0.000	-0.381	0.000	-0.385	0.000	-0.403	0.000	-0.119	0.000	-0.376	0.000
ldbv	-0.166	0.000	-0.067	0.002	-0.121	0.000	-0.143	0.000	-0.032	0.106	-0.120	0.000
ldmv	-0.330	0.000	-0.254	0.000	-0.326	0.000	-0.297	0.000	-0.213	0.000	-0.315	0.000

Relationship 3: Determinants of capital structure and the firm's financial performance

Regarding the third relationship, results confirm that assets structure, growth opportunities, firm's risk and liquidity have a significant positive relationship with the financial performance. On the other hand, non-debt tax shields have significant negative relationship with financial performance. However, analysis shows contradict results for firm's size and industry type relationships with the firm's financial performance (Table 3-1 to 3-8 in the appendix).

Panel data analysis results- Relationship 3:

Table 3-1 Assets structure and the firm's financial performance:

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
ROI	0.136	0.000	0.126	0.000	0.172	0.000
ROE	0.142	0.000	0.140	0.000	0.184	0.000

Table 3-2 Growth opportunities (Tobin's Q) and the firm's financial performance:

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
ROI	0.474	0.000	0.416	0.000	0.426	0.000
ROE	0.463	0.000	0.447	0.000	0.449	0.000
PE	0.476	0.000	0.462	0.000	0.464	0.000

Table 3-3 Growth opportunities (sales growth) and the firm's financial performance:

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
ROI	0.163	0.000	0.187	0.000	0.179	0.000
ROE	0.165	0.000	0.185	0.000	0.180	0.000
PE	0.209	0.000	0.189	0.000	0.202	0.000

Table 3-4 Firm's size and the firm's financial performance:

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
ROI	0.088	0.000	-0.127	0.000	-0.027	0.294
ROE	0.165	0.000	0.025	0.496	0.102	0.000
PE	0.073	0.000	0.045	0.329	0.040	0.132

Table 3-5 Firm's Risk and the firm's financial performance:

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
ROI	0.125	0.000	0.100	0.000	0.105	0.000
ROE	0.136	0.000	0.107	0.000	0.112	0.000
PE	0.028	0.072	0.057	0.000	0.046	0.001

Table 3-6 Non-debt tax shields and the firm's financial performance:

DV	Pooled OLS:		Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)	Coef.	P (Sig)
ROI	-0.183	0.000	-0.247	0.000	-0.237	0.000
ROE	-0.169	0.000	-0.258	0.000	-0.239	0.000
PE			-0.127	0.000	-0.054	0.020

Table 3-7 Liquidity and the firm's financial performance:

DV	Fixed effects		Random effects	
	Coef.	P (Sig)	Coef.	P (Sig)
ROI	0.130	0.000	0.098	0.000
ROE	0.103	0.000	0.073	0.000

Table 3-8 Industry control variable and the firm's financial performance:

	Industry	
Dependent variable	Coef.	P>z
ROI	0.234	0.002
ROE	0.261	0.001

Relationship 4: debt level mediates the direct relationship between determinants of capital structure and firm's financial performance

Fourth relationship tests whether debt level mediates the relationship between determinants of capital structure and firm's financial performance. Results reveal that debt level mediates this relationship, but this mediating role is partial and very small. The mediating role of debt does not change the relationship between determinants of capital structure and firm's financial performance in regard of its significance. However, the only change appeared as very small changes in the coefficients of these determinants in the relationship with firm's financial performance. This indicates that debt plays a partial[19] mediating role only (Table 4).

Panel data analysis results- Relationship 4:

The following table shows the changes in the independent variables' coefficients caused by the mediating role of debt, the first set using ROI as a dependent variable and four measures of debt as a mediating variable; each debt measure is used individually, followed by the second set for ROE and third for P/E.

Table 4 Testing the Debt mediating role*:

		ROI +				**ROE+**				**PE +**			
		TDBV	**TDMV**	**LDBV**	**LDMV**	**TDBV**	**TDMV**	**LDBV**	**LDMV**	**TDBV**	**TDMV**	**LDBV**	**LDMV**
ange s	Ppe	0.002	0.012	0.001	0.015	0.004	0.007	0.001	0.002	0.019	0.012	0.006	0.023
	rvgth	0.008	0.002	0.012	0.001	0.000	0.001	0.008	0.000	0.022	0.002	0.022	0.001

[19] In the full role of mediating; the direct relationship between determinants of capital structure and financial performance becomes insignificant. However; in this research the role is partial.

	Tsq	0.015	0.106	0.038	0.035	0.014	0.069	0.016	0.004	0.134	0.063	0.124	0.037
	Lgta	0.029	0.018	0.030	0.025	0.010	0.009	0.004	0.003	0.076	0.035	0.072	0.045
	Sdiv	0.005	0.004	0.004	0.001	0.001	0.001	0.000	0.000	0.002	0.004	0.000	0.002
	Dda	0.001	0.003	0.009	0.002	0.004	0.001	0.003	0.000	0.006	0.002	0.003	0.001
	Crt	0.051	0.046	0.016	0.001	0.026	0.026	0.012	0.001	0.023	0.031	0.007	0.004
Debt Coef.		-0.134	-0.186	-0.047	-0.080	-0.074	-0.107	0.015	-0.009	0.002	-0.140	-0.021	-0.103
Debt t value		-6.480	-7.100	-2.390	-3.330	-3.120	-3.590	0.660	-0.350	0.080	-4.360	-0.850	-3.410
Debt P (Sig)		0.000	0.000	0.017	0.001	0.002	0.000	0.510	0.725	0.940	0.000	0.394	0.001
R2 without debt		0.207				0.203				0.230			
R2 with debt		0.211	0.203	0.220	0.208	0.195	0.195	0.212	0.205	0.247	0.230	0.249	0.227
F without debt		188.230				163.310				99.670			
F value- with debt		179.740	173.380	174.640	166.550	144.490	145.040	145.460	142.860	101.260	90.100	100.100	88.960

*The above table use three dependent variables (ROI, ROE, and PE) and four mediating measures (TDBV, TDMV, LDBV, and LDMV).

In general, even both regressions before and after the inclusion of debt level are significant, it is noted that debt level has slight mediating role on the relationship between the determinants of capital structure and financial performance.
In addition, we run F test according to Schroeder, Sjoquist, and Stephan (1986) to decide whether the mediating effect is statistically significant. This test investigates the significance of the difference between two R-squares in two different models. Results show that the inclusion of debt is significant when we include only the debt measured by the book value, either using total debt or long term debt (TDBV and LDBV), meanwhile the inclusion of the market value debt are not significant (all regressions are explained in the Appendix)

V.3 Discussion of results

V.3.1 First relationship

Results of the majority of the determinants of capital structure in this research are found as predicted and support related theories. It is also consistent with those who investigate the mix of capital structure. However, results reveal that firm's risk has highly insignificant relationship with debt level in all methods. Therefore, we conclude no clear role for firm's risk in determining the capital structure. These results are supported by (Titman & Wessels 1988), (Ozkan 2001), (Bevan & Danbolt 2002), (Maris & Elayan 1990) and (Thies & Klock 1992) for the US firms, and also supported by the contradict results found by (Wald 1999).
Moreover, results reveal that non-debt tax shields have contradicted results with debt level. Therefore, we also conclude no clear role for non-debt tax shields in determining the capital structure. These results have been confirmed before, for example, (Titman & Wessels 1988) find a reverse (positive) relationship with debt level justifying that by the using of the operating income in the dominator instead of total assets. Non-debt tax shields scaled by operating income have a strong negative correlation with the operating income scaled by total assets. In addition, (Akhtar 2005) and (Brailsford, Oliver, & Pua 2002) find no relationship.
Furthermore, industry characteristics have been confirmed to have a positive and significant relationship with debt level in the sample. Also, it has been noted graphically that debt level is higher for the industrial firms than non-industrial firms in this study sample. This positive result means that these companies follow and support the trade-off theory which assumes that firms

within the same industry have similar capital structures since they have equivalent types of assets, business risks and profitability (Phillips & Sipahioglu 2004). This result is also supported by (Ferri & Jones 1979) for the US companies, (Akhtar 2005) for the Australian firms, and (Allen & Mizunot 1989) for Japanese companies.

V.3.2 Second relationship

Results of pooled (OLS), fixed and random effect show a negative and significant relationship between debt level and firm's financial performance in all regressions. An explanation for a negative relationship suggests that the agency conflicts between managers and shareholders are the main reason for such relationship. As it noted before, maybe the UK firms are employing more than appropriate level of debt in their capital structures thus negatively influencing performance. Higher debt levels leads to higher debt burden which may then limits the ability of the firm to take on more risky profitable projects. Firms may have more debt than appropriate for two reasons. First, higher levels of debt align the interest of managers and shareholders (Harris & Raviv 1991). Second, managers may underestimate the costs of bankruptcy reorganization or liquidation. Both of these factors suggest higher than appropriate levels of debt, then this results in lower performance.

In addition, these results are consistent with (Jensen 1986) that if debt acts as a bonding device in terms of forcing managers to commit free cash flows to service debt, then higher debt will leads to lower funds available for managers in profitable investments and then lower performance (Singh & Faircloth 2005). Also, it is consistent with (Gleason, Mathur, & Mathur 2000) for 14 European countries, (Singh & Faircloth 2005) for US firms.

Moreover; firm's size and industry type are found to have contradicted relationships with the firm's financial performance in panel data analysis. Therefore, we could not conclude any clear role for these control variables.

V.3.3 Third relationship

V.3.3.1 Assets structure

Results of pooled (OLS), fixed and random effect methods reveal a positive relationship and highly statistically significant at 1% level between assets structure and both ROI and ROE. The reason behind this relationship may be that firms with high tangible assets are stronger to face financial distress because of its liquidation value since these assets are considered as productive resources.

Another possible reason may be due to that firms who have these assets has a good reputation in getting funds especially if it used as a guarantee for external debt, these funds are used in a profitable projects result in more returns. A further possible reason that the majority of our sample are industrial which considered capital-intensive (those companies who rely mainly on their fixed assets to make their products) not labour-intensive technology and this would speed up the production process as well as improve the quality of product (Shergill & Sarkaria 1999) and then improve the financial performance.

V.3.3.2 Growth opportunities

Results of pooled (OLS), fixed and random effect models support a positive relationship for Tobin's Q (tsq) and sales growth (rvgth). These results are highly significant at 1% for all regressions. Moreover, it has been noted that Tobin's Q reveals a stronger relationship with firm's financial performance than sales growth. This strong relationship is referred to the way that the Tobin's Q is measured. Because Tobin's Q contains the market value of equity in the dominator and this value is logically high correlated with the performance measures. This also supported by the correlation matrix which reveals high and significant correlation between the

Tobin's Q and the three measures of performance ROI, ROE, and PE of 0.42, 0.37, and 0.46 respectively.
These results are supported by (Hall 1987) who states that Tobin's Q in the UK is a good indicator for the firm to survive, and reflects how investors regard the company (Brigham & Ehrhardt 2005). It is well-known that growth opportunities are considered an indicator for the firm's success and this could be reflected in the firm's performance. Also, firms with high growth opportunities have lower agency costs (Hutchinson & Gul 2006b). Firms with greater growth opportunities might have lower debt levels due to the fear of debtholders that firms may forego valuable investment opportunities and expropriate wealth to their benefit, this results in lower agency costs.
According to the agency theory, growth opportunities enlarge managers' power. This can be treated as an advantage for the company, that these managers use this power to enlarge the firm's performance although they enlarge their own wealth in the same time. Additionally, high growth firms have easier access to the finance market, this can be translated in higher performance, because banks are more advocated to lend companies presenting a superior growth rates or valuable future firms' growth opportunities (Chen 2004).
This result is supported by those who find a positive relationship for growth opportunities with performance like (Brush, Bromiley, & Hendrickx 2000), (Axinn 1988) for USA, (Hutchinson & Gul 2006a) for Australia, and (Bushman, Indjejikian, & Smith 1996) using Hewitt Associates' compensation surveys of public domestic companies.

V.3.3.3 Firm's size

Results of the size-performance regressions show contradicted results. Meanwhile pooled (OLS) regressions show a positive and highly significant for all dependent variables; fixed effect models show a negative and significant for ROI, but weak and positive for ROE and PE. However, both are highly insignificant. Random effect model on the other hand shows a negative and highly insignificant relationship with ROI, positive and significant with ROE, and positive and insignificant with PE. Consequently, we could not confirm any relationship between the firm's size and firm's financial performance.
A possible reason may lead this relationship in this research sample that, it is not important for a company to be large or small in order to have a superior performance. It is well known that in the UK market there are many small technology and services companies which depend on few assets and/or few numbers of employees and accomplish superior percentages in their performance.
These results are supported by previous studies which find no clear role for the firm's size on the performance. However, these studies usually use only one indicator to reflect the financial performance, and also many studies depend on the number of employees to reflect the firm's size.
Those who find a positive effect for firm's size support the arguments that size reflects greater diversification, economies of scale production, greater access to new technology and cheaper sources of funds. These studies include (Orser, Hogarth-Scott, & Riding 2000) using gross revenues and number of employees and changes in gross revenue for Canadian firms find that less than one quarter of the sampled businesses reported revenue increases.
On the other hand, those who find a negative relationship between firm's size and performance include (Forbes 2002) investigating the effect of large depreciation on firm's performance uses firms from 42 countries finds that larger firms in terms of total assets are frequently have worse performance in terms of ROA than smaller firms since larger firms have larger depreciation expenses. Also (Chakrabarti & Halperin 1990) for US firms show that performance (R&D

expenditure) are different in firms of different sizes (annual sales). They confirm that small firms are more productive in innovation than the large firms. Finally, (Goodman, Peavy III, & Cox 1986) using Standard & Poor's firms, find that portfolios containing small capitalization firms provided positive abnormal returns, whereas stocks of large firms tended to underperform.
Those who find no relationship using export performance and the number of employees include (Wolff & Pett 2000) for US firms, and (Moen 1999) for Norway companies.

V.3.3.4 Risk

Results of pooled (OLS), fixed and random effect methods regressions reveal a positive and statistically significant relationship between firm's risk and firm's financial performance (ROI, ROE and PE). It has been noted that the majority of the previous studies targeted the return of stock as a performance measure. However, it is interesting to investigate this relationship using different firm's financial performance measures as it has been confirmed in this research.
The reason of such a relationship in the UK sample is due to the theoretical prediction of the risk-return trade-off. The standard relationship between risk and return in the CAPM model is positive, higher risk leads to higher return. There are many studies support this relationship like (Ser-Huang & Taylor 1992) for the UK, (Ludvigson & Ng 2007a) using US market, (Loudon 2006b) for 15 markets, (Assaf 2005) for Canadian stock exchange, (CORHAY, HAWAWINI, & MICHEL 1987) and (Guo 2006) giving international evidence, (Dewan, Shi, & Gurbaxani 2007) using Fortune 1000, and (BALI T. & Peng L. 2006) for S&P 500 index.

V.3.3.4 Non-debt tax shield

Results of pooled (OLS), fixed and random effect methods regressions reveal a negative and statistically significant relationship between non-debt tax shields and firm's financial performance (ROI and ROE), and also for fixed and random effect models for the PE.
A possible justification for such a relationship considering that the benefits from these non-debt tax shields for the UK firms may be obtained in the long-run, but the immediate impact on performance is negative. This reason was adopted by (Forbes 2002) who uses firms from 42 countries and finds that in the year after depreciations, firms have significantly higher growth in market capitalization. This suggests that depreciations increase the present value of firms' expected future profits. On the other hand, significantly lower growth in net income suggests that even if firms benefit from depreciations in the long run, the immediate impact on performance could be negative. However, there is no previous studies intended the non-debt tax shields and its relationship with firm's financial performance. Therefore, it is worthy to investigate this relationship for UK sample. This importance is confirmed by the significant results appeared above.

V.3.3.5 Liquidity

Fixed and random effect models reveal a positive and highly significant relationship between liquidity and ROI and ROE. However, to the researcher's knowledge, apart from (Wang 2002) who addresses the liquidity management, no studies highlight the relationship between liquidity and firm's financial performance. A possible reason for this relationship maybe due to that firm's high liquidity position indicates that firm is strong to face any short or long-term financial problems. Consequently, this strong firm can perform better than weak firms which have low current ratios in their financial statements. The reason that there are no studies targeted the liquidity and its effect on the performance might be that liquidity also is used as a performance measure, this depends on a study objectives. However, this research considers liquidity as a determinant of the capital structure.

V.3.3.6 Industry

Results show that industry type has a positive and significant relationship with ROI and ROE. Therefore, industrial firms perform better than the non-industrial firms in the UK sample targeted in this study. This result is supported graphically that the industrial companies have larger performance (an average for all performance measures) than the non-industrial companies in this study sample.

A possible justification for this result maybe lies on the light of the nature of productive assets suitable for the industrial UK firms. Industrial firms are considered to be capital-intensive which depend mainly on fixed assets not labour-intensive technology, this perhaps speeds up the production process as well as improve the quality of product, and this has been reflected in a higher performance. this result is supported by (Shergill & Sarkaria 1999) and (Hitt & Ireland 1985) that production/operations activities have been found to be related positively with performance.

V.3.4 Fourth relationship

In order to test the debt mediating role, regressions made include the determinants of capital structure in conjunction with debt level and regress all on financial performance. The following hypothesis has been tested

H4: Debt mediates the relationship between determinants of capital structure and firm's financial performance

These procedures will be discussed for the first regression in relationship 4 (i.e, TDBV as a mediator between determinants of capital structure and financial performance). Moreover, a summary for the effect of other measures of debt as a mediator in all regressions made will be given afterwards.

The mediating role of debt level is checked by following the procedures specified by (Baron & Kenny 1986) and (Miles & Shevlin 2001). Following these procedures, a series of analyses were conducted to test if whether or not debt level mediates the relationship between determinants of capital structure and financial performance:

1. Using fixed effects regression, determinants of capital structure (X) are found to be significant predictors of financial performance (Y) (ROI): (R-squared= 20%, F= 188.23, p<F 0.0000).
2. Using fixed effects regression, determinants of capital structure (X) are found to be significant predictors of debt (M) (TDBV): (R-squared= 27%, F= 87.52, p< 0.0000).
3. Using fixed effects regression, debt (M) is found to be significant predictor of financial performance when determinants of capital structure (X) are accounted for (R-squared= 21%, F= 179.74, p< 0.0000).

When the influence of debt on financial performance is accounted for, very small changes occurred for the coefficients of determinants of capital structure after the inclusion of debt level, the researcher use the absolute value to check for these changes. The relationship is significant with or without inclusion of debt level. However, this does not mean that debt has no role; therefore, we go further to test the coefficients of independent variables to find any changes after the inclusion the debt level in the direct relationship between determinants of capital structure and firm's financial performance.

According to the full role of mediation, the relationship between the independent variable/s and dependent variable/s should be through the mediator. However, in this research the debt mediating role is partial. This makes the direct relationship between dependent variable/s and

dependent variable/s less significant and/or the coefficients which represent the relationship will be affected as it has been confirmed here in this research.
The use of absolute value is to see how much will be the changes in the coefficients of independent variables to prevent negative changes. This research is looking for whether or not the debt level will change the relationship between determinants of capital structure and firm's financial performance regarding its sign.
The mediating role of debt does not change the relationship between determinants of capital structure and the financial performance except for very small changes in the coefficients of these determinants. This indicates that debt level plays a partial mediating role only.
In general, even both regressions before and after the inclusion of debt level are significant, it is noted that debt level has slight mediating role on the relationship between determinants of capital structure and financial performance. Results are summarised in the appendix.
As a result, although the debt mediating role is small but it cannot be ignored. Therefore, we accept hypothesis 4, and concludes that there is a mediating role for the debt level on the relationship between determinants of capital structure and financial performance.
Additionally, this research tests the mediating role of the debt in other regressions for all debt measures with all performance measures used. Generally, same results have been confirmed (i.e., a very small mediating role for debt) as it appears in the absolute change in the coefficients of the independent variables.

VI. Conclusion

The research on the relationship between debt level and financial performance as well as the important role of determinants of capital structure on firm's financial performance is limited. The importance of determinants of capital structure is to find out the optimal mix of capital structure which minimizes the firm's weighted average cost of capital. This mix maximizes the firm's financial performance in terms of shareholders' value. Consequently, this mix of capital structure indentified by the debt level can play as a bridge between the determinants of capital structure and firm's financial performance, then the determinants of capital structure can be important to the financial management, this research attempts to fill in this gap.
Using three panel data methods, pooled (OLS), fixed and random effect models, this research tests four relationships according to the above objectives. First, results support to a high extent the results of previous studies which investigate the determination of the capital structure. Second, this research confirms a negative and highly significant relationship between debt level and firm's financial performance. Third, this research confirms that assets structure, growth opportunities, firm's risk and liquidity have a significant positive relationship with the financial performance. On the other hand, non-debt tax shields have significant negative relationship with firm's financial performance. However, the research shows contradicted results for the firm's size relationship with firm's financial performance.
Fourth, this research tests whether debt level mediates the relationship between determinants of capital structure and firm's financial performance. Results reveal that debt level does mediate this relationship but this mediating role is partial. This means that this mediating role of debt does not change the relationship between determinants of capital structure and firm's financial performance in regard of its significance, but the change appeared as very small changes in the coefficients of these determinants in the relationship with firm's financial performance.
There are several important contributions of this study that advance the knowledge in the area of capital structure and performance. First, this is the first comprehensive study examining the

relationship between determinants of capital structure, debt level, and a firm's financial performance, as denoted by the fourth relationship. Also, to our knowledge, this is the first comprehensive study to investigate the relationship between determinants of capital structure and financial performance for the UK capital market from the perspective of capital structure theories.
Second, this is the first study to test and prove the mediating role of debt in the relationship between determinants of capital structure and a firm's financial performance.
Third, choosing a performance measure that represents the shareholders' value represents a real challenge; this study picks four performance measures which are closest and represents the point of view of the shareholders.
Fourth, this is the first study to prove that there is a relationship between assets structure, liquidity and non-debt tax shields on the one hand, and firm's financial performance on the other.
The primary lack of this study is the lack of complete data availability. Databases and the annual reports did not provide information about certain variables which may have an important effect like remunerations and ownership structure indicators. However, including these variables for longer period could help in explaining the firm's financial performance.
Recommendations for future studies can spot the important role of the determinants of capital structure and its effect on the financial performance which show significant effect in the current study like assets structure, growth opportunities, and non-debt tax shields. Moreover, the important role of the debt level on the corporate performance is still ignored. Likewise, the significant role of debt level as a mediator variable for the relationship of variables affecting the corporate performance should be paid more efforts and more studies are vital to capture the accurate role of debt in this concern. This research finds a significant mediating role of debt for the relationship between the determinants of capital structure and the financial performance; this recommends more future studies in this field.
The effect of remunerations and ownership structure on the relationship between debt level and performance is subject to re-validation once more data are available. In addition, the role of the ownership structure in determining the capital structure decision is still an interesting topic once this information becomes available, especially for the managerial ownership.
Moreover, regarding the contradicted results for the relationship between firm's size and performance, more efforts are needed to investigate the size in different measures with the performance for the UK market. Furthermore, future research can be foreseen for this research models among industry sectors to see if there are any differences in the study relationships among different industries.
Implications: First, regarding the negative relationship between debt level and firm's performance and the highly significant mediating role of debt, this possibly indicates that the UK firms do not use debt as a control mechanism. This has been supported by the reasonable debt percentage in the study sample. It is possible that these UK firms use other mechanisms like remunerations which have been confirmed[20] to have a positive relationship with the financial performance.
Second, the negative relationship between debt level and firm's performance explains that borrowing hastens the separation between the stockholders and lenders, and also restricts the

[20] Results for the effect of remunerations are not included in this research. A positive relationship between remuneration of CEO and firm performance has been confirmed in this research using cross-sectional data for the year 2005. This predicts that performance-based compensation reduces agency conflicts, and can be a clear implication of the relevance of incentive compensation to align the interests of shareholders and managers.

firm's ability to utilize more profitable projects. This possibly indicates that the UK firms are attempting to grow through less risky routes (Phillips & Sipahioglu 2004), especially that the UK is considered to be a "market-oriented" not a "bank-oriented" country (Rajan & Zingales 1995). This should be well understood by the CEOs within the study sample that borrowing does not necessarily lead to higher performance, but could contribute to low performance as stated by the agency theory. A negative relationship suggests that more efforts should be taken regarding legislative rules and policies to help firms in reducing the dependence on debt in their capital structures.

Third, lenders of the UK firms put greater emphasis upon the assets structure of the firm and its size. This can be an implication that firms invest in fixed assets instead of intangible assets to get more debt.

Fourth, regarding the negative relationship between growth opportunities, profitability and liquidity on the one hand, and debt level on the other, debt is recommended to be a refuge for some firms. Those who have fewer growth opportunities are recommended to benefit from debt issuance in maximizing their future investments in order to enlarge their profits and enhance their liquidity position.

Fifth, the negative relationship between profitability and debt level possibly suggests efforts towards decreases of the UK tax rates. Therefore, this will assist firms in generating cash flows and self-financing, and accordingly resulting in a healthier debt structure.

Sixth, regarding the strong significant direct relationship between determinants of capital structure and firm's financial performance, managers should devote their time and efforts on these determinants in order to maximize the welfare of the shareholders. Efforts should be paid for the importance of each determinant and accordingly its effect on the upshot of the firm (i.e., shareholders' benefits).

Seventh, the positive relationship between tangibility of assets and performance suggests that firms may consider investing in the fixed assets (capital-investments) in order to enlarge the shareholders' welfare.

Eighth, this research confirms that higher performance is related to higher liquidity position and this contributes in making stronger solvency position. This gives the management guidance to build a clear and controllable investment policy which leads to the investment in profitable projects to create and preserve the interests of their shareholders.

Appendix:

F test: Is mediating effect is statistically significant?

In order to find if the debt level inclusion in the fourth model make a difference statistically, we run F test according to Schroeder, Sjoquist, and Stephan (1986). This test investigates the significance of the difference between two R-squareds? The first model is relationship three in our study, which is the relationship between determinants of capital structure and the financial performance directly without the inclusion of the debt level (interaction effects). The second model is decoded by relationship four in this study; this relationship is between determinants of capital structure and debt level (interaction effects) in one hand, and the financial performance in the other.

The following table represents the R-squared values for regressions of ROI before and after the inclusion of the debt level and the significance change for these two values.

Table 5-1 Difference between two R-squares-ROI

	ROI			
	TDBV	TDMV	LDBV	LDMV
R2-2	0.2111	0.2025	0.2202	0.2076
R2-1	0.2072	0.2072	0.2072	0.2072
K2	8	8	8	8
K1	7	7	7	7
n	3883	3888	3871	3887
F	19.1515	-	64.3832	1.9576
Prob F	0.0000	1.0000	0.0000	0.1619

From the above table, we can see that the inclusion of debt is significant when we include only the debt in a book value; TDBV and LDBV, meanwhile the inclusion of the market value debt are not significant, although the debt level was significant in relationship four for all debt measures used.

The following table represents the R-squared values for regressions of ROE before and after the inclusion of the debt level and the significance change for these two values.

Table 5-2 Difference between two R-squares-ROE

	ROE			
	TDBV	TDMV	LDBV	LDMV
R2-2	0.1947	0.1945	0.2117	0.2048
R2-1	0.2033	0.2033	0.2033	0.2033
K2	8	8	8	8
K1	7	7	7	7
n	3762	3760	3757	3759
F	-	-	39.9381	7.0737
Prob F	1.0000	1.0000	0.0000	0.0079

From the above table, we can see that the inclusion of debt is significant for the long-term debt (LDBV and LDMV) not in the total debt. Although the debt level was significant in relationship four for TDBV and TDMV, and LDBV and LDMV were highly insignificant.

The following table represents the R-squared values for regressions of PE before and after the inclusion of the debt level and the significance change for these two values.

Table 5-3 Difference between two R-squares- PE

	PE			
	TDBV	TDMV	LDBV	LDMV
R2-2	0.2471	0.2301	0.2491	0.2274
R2-1	0.2299	0.2299	0.2299	0.2299
K2	8	8	8	8
K1	7	7	7	7
n	3385	3414	3379	3414
F	77.1247	0.8845	86.1686	-
Prob F	0.0000	34703053	0.0000	1.0000

From the above table, we can see that the inclusion of debt is significant when we include only the debt in a book value (TDBV and LDBV), meanwhile the inclusion of the market value debt are not significant. However, debt level was significant in relationship four for market value debt, but highly insignificant for the book value debt.

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Is BLASH possible in Hedge Funds? An approach to Seasonality[21]

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Abstract

Several studies have shown that seasonality behavior exists in different financial markets, especially in the spot market of equities and bonds. Fewer studies, however, have considered the extent to which seasonality also occurs in the monthly returns in hedge funds indexes. Many market participants have observed frequently a December Spike, what has allowed financial community to accept this effect as a widespread occurrence. This paper intends to determine whether seasonality exists across hedge funds strategies, by comparing, for the period of 1998-2008, the performance of the EDHEC indexes with the CSFB/Tremont indexes, regarding seven main strategies. The results do not reject the hypothesis of seasonality, comparing the two data sources, showing that there are significant higher returns in December, as well as lower and negative returns during the months of July, August and September. These results suggest that BLASH (Buy Low/Sell High) is possible in Hedge Funds management.

Keywords: Hedge funds; management incentive fees; seasonality.
JEL codes: G11; G12; G15.

I. Introduction

Seasonality and behavior patterns organize our daily life. From weather to energy consumption patterns, seasonality is clearly present. Several different studies have demonstrated that seasonality behavior exists in different financial markets, especially in the spot market of equities and bonds.

Seasonality in financial markets implies that in general there are greater returns in some monthly periods than others. This allows the investor to buy during the monthly periods of lower returns and sell in the periods of higher returns. That being the case, the question is whether this strategy can be applied to the monthly returns in hedge funds indexes. Many market participants have observed that a spike in the month of December occurs frequently, and that has permeated the financial community to accept this effect as a common occurrence, the December Spike. Taking into account the positive effect of the December Spike, what other patterns may we consider throughout the year?

The purpose of this paper is to determine first, if seasonality exists across hedge funds indexes in the strategies considered and second, whether hedge funds managers should use the BLASH (Buy Low And Sell High) strategy. In this context, we address two questions: Do the wide variety of hedge funds strategies follow seasonality? Is seasonality an opportunity for major gains in managing hedge funds?

To address these questions we study the performance of the "index of the existing indexes", the EDHEC indexes and compare them with one of the most representative indexes of hedge funds, the CSFB/TREMONT indexes, regarding seven main strategies: Equity Market Neutral, Long/Short Equity, Global Macro, Fixed Income Arbitrage, Event Driven, Emerging Markets and Convertible Arbitrage, during the period of January 1998 till December 2008.

This paper is structured as follows. The next Section presents a literature review on the main issues of seasonality in hedge funds. Section three describes the data and methodology. Section four reports the results of our empirical analysis and Section five provides the concluding remarks.

II. Literature Review

The issue of extreme hedge funds returns is well documented in the article of Brulhart and Klein

(2005). The market participants long assume a common perception that consistent and substantial returns from hedge funds come hand in hand with high risk and potentially substantial losses. These authors looked at the extreme event risk of hedge funds and found that the skew and kurtosis in hedge funds returns do not necessarily imply exposure to undue risks. Comparing hedge funds and traditional asset distributions, they found that it does not appear to be any evidence of undue risks in hedge funds, at least relative to equity indexes. They conclude that, based in historical data, from January 1994 till December 2004, hedge funds investors have experienced higher returns without taking on undue risks and that the use of leverage in a portfolio of hedge funds does not necessarily results in risk greater than that of equities.

The subject of seasonality in hedge funds is quite recent in the academic research. One of the first papers that specifically studies seasonality in hedge funds is the study of Agarwal et al. (2007), which documents that hedge funds returns during December are significantly higher than those during the rest of the year.

Assuming the positive effect of December in hedge funds monthly returns, we question if there are other seasonality effects during the year, positive or negative.

Considering the database of the Hedge Funds Research Indexes, from January 1990 till December 2005, as representative of most hedge funds strategies, Olszewski (2006), demonstrated, through quarterly and monthly dummy variable regressions, that various months have different effects on the various hedge funds strategies. He found that certain quarters had a greater positive effect on hedge funds strategies returns than others and that the strategies have different characteristics in different months. He demonstrated that in December and January, the percentage of hedge funds strategies with positive and significant coefficients was higher while from August to October it was lower.

In their last paper, Agarwal et al. (2007) documented that hedge funds returns during December are significantly higher than average returns from January to November. They used a comprehensive database of hedge funds, from January 1994 to December 2002, constructed from a combination of four large databases, namely, Center for International Securities and Derivative Markets (CISDM), Hedge Funds Research (HFR), Morgan Stanley Capital International (MSCI) and Tremont Advisory Shareholder Services (TASS). They found that a risk-based explanation could not fully explain the December spike, consistent with the opinion of Brulhart and Klein (2005). Therefore, they explored another reason for the potential inflation of December returns, such as Management Incentives. In the mentioned paper Agarwal et al. (2007) investigate the relation between incentives and the December spike, and showed that the spike is driven by incentives to improve performance. There are two main incentives for management performance: the first one relates to the promise of rewards for good performance and the second to the threat that poor performance funds induce capital withdrawals. Accepting these two types of incentives, it is clear that funds ought to have opportunity to manage returns. Hedge funds managers have more opportunity to manage returns when the funds' volatility and exposure to illiquidity risk are higher.

The phenomenon of "returns management" in hedge funds is very resembling to the well-know "earnings management" phenomenon in corporations. In the context of earnings management in corporate firms there is a large literature including DeGeorge et al. (1999), Murphy, K. (1999), Core et al. (2003), Efendi et al. (2007) and Bergstresser and Philippon (2006). These authors defend the strong possibility of managing financial statements when the manager has personal interests in good performance at the end of the year. Carhart et al. (2002) contend that mutual funds managers also trade strategically in the securities they hold to inflate the year-end prices.

Agarwal et al. (2007) found that the magnitude of spike at year-end relative to that at the end of the quarter is much higher for hedge funds compared to mutual funds. This is consistent with their theory that incentives at year-end have a strong effect in managing returns. Another important cause for returns management is the possibility of return smoothing by hedge funds. This hypothesis is consistent with the findings of Getmansky et al. (2004) of positive autocorrelations in monthly returns attributing it to hedge funds' exposure to illiquidity and potential smoothing of returns. The authors Bollen et al. (2007) argue the opposite, demonstrating that it is difficult to detect intentional smoothing of returns by looking at autocorrelations.

However, according to Agarwal et al. (2007) hedge funds can intentionally smooth returns to present higher returns at the year-end, mainly because the timing of financial auditing. They defined four main hypotheses:

Hypothesis 1: All else being equal, December returns should be higher than the returns during other months.

Hypothesis 2: All else being equal, funds that have higher incentives (higher moneyness, higher delta, higher relative performance, higher lockup restriction periods, and higher dollar management fee) should exhibit greater December spikes. Further, funds with greater opportunities (higher volatility and greater illiquidity) should also exhibit greater December spikes.

Hypothesis 3 (Savings hypothesis): All else equal, December returns should be higher when reserves leading up to December are higher.

Hypothesis 4 (Borrowing Hypothesis): All else equal, higher hedge funds returns in December should be followed by lower returns in January of the following year.

The results of these hypotheses reveal that:

- there is a new empirical regularity of hedge funds returns in December being systematically higher than their average returns during the rest of the year;
- the management incentives motivate funds to inflate returns at the year-end, and funds with greater incentives (higher moneyness, higher delta, higher relative performance, higher lockup restriction periods and higher dollar management fee) exhibit a larger December spike; also, the funds with greater opportunities (higher volatility and greater illiquidity) exhibit a larger December spike.
- there is evidence that funds underreport their returns in the early part of the year in order to create reserves for possible poor performance later in the year;
- there is also evidence that funds push up the security prices at December-end by last-minute buying in derivatives markets, which is followed by price reversals in January.

Considering the two first results, they suggest that hedge funds may be engaging in returns management, similar to the already documented phenomena of earnings management in corporations.

The last two findings imply that saving reserves left unutilized are added to December returns inflating the December NAV, and that there is effective borrowing from January returns.

Considering the four hypotheses and the implication upon the spot market of this borrowing effect, there is an interesting paper by Chen and Signal (2001) about the January effect in U.S. equity markets (i.e., where some stocks experience large returns). Early research about the January effect in the spot equity market includes several researchers, namely Roll (1983), Keim (1983) and Reinunganum (1983), among many others. Keim (1983) and Reinganum (1983) found that the January effect applies mainly to small firms. Roll (1983) suggests that this is due to the fact that

small firms are more likely to be subjected to volatile and extreme prices.
Chen and Signal (2001) study covers the period from 1987 through January 1999, considering a sample of the mainly stocks traded on NYSE, AMEX and NASDAQ. They examined various hypotheses relating the January effect, namely window dressing, information availability and tax loss-selling.
Most of the relations were not supported, with the hypotheses of window dressing being the solely cause of the January effect. According to Haugen et al. (1988) and Lakonishok et al. (1991) the January effect means that institutional managers are evaluated on their performance and philosophy investment. Therefore, they replace stock losers with winners in December and at the beginning of January, investment managers reverse the process by selling winners, large stocks and low risk stocks replacing them with other smaller and riskier stocks, which includes typically past losers with great potential for a near future. This behavior, in particular of mutual funds managers, has been studied by Chevalier et al. (1997) who present a model concerning funds manager behavior, once again based on incentives that are typically related to the amount that funds can attract mainly due to the returns they present at the end of the year.
Other important hypotheses studied by Chen and Singal (2001) are the Tax-Loss Selling Hypothesis and Tax-Gain Selling Hypothesis, jointly referred to as the Tax-Selling Hypothesis. They conclude that investors sell losers in December due to the tax benefit of capital losses. In January, those losers earn high returns because the selling pressure has ceased, resulting in the January effect. After rearranging the sample based on Potential for Tax-Loss Selling, simply referred as PTS, and comparing the difference between the last days returns in December and the first days returns in January, Chen and Singal (2001) found evidence consistent with the Tax-Loss Selling Hypothesis, implying that the higher the PTS the lower is the December return or the lower the PTS the higher is the December return. This is even more significant when considering smaller and riskier stocks. Evidence in support of the Tax-Loss Selling Hypothesis includes abnormally high returns (6,3%) in the first five trading days of January for stocks with the greatest PTS. According to Chen and Singal (2001) both stock return and volume results are consistent with both window dressing and tax-related selling hypotheses.
Other hypothesis considered by the authors refers the effect of differential information available. Rozeff and Kinney (1976) found that the excess in January returns is the effect of significant information releases that occur in the first few days of January. Barry and Brown (1984; 1985) suggest that stocks with less information available produce higher non-systematic risk, although the systematic risk remains unchanged. Brennan and Surbrahmanyam (1995) also present an interesting hypothesis related to the number of analyst covering each stock. They argue that, if the information hypothesis being related to the number of analysts is consistent and if the information hypothesis is correct, then the January return should be negatively related to the number of analysts, that is: the fewer the analysts, the greater should be the January returns.
Chen and Singal (2001) provide evidence, after examining three main hypotheses relating the January effect, namely window dressing, information availability and tax loss-selling, suggesting that the Tax-Related Selling is the primary cause of the January effect, consistent with the findings of Constantinides (1984). The first two hypotheses do not provide much support, as they should be clearly stated both in December and in June. The PTS hypothesis is supported by changes in volume in December and in January. It is clearly revealed that with this strategy investors are able to postpone payment of taxes up to one year.
We find this research based on the spot markets crucial to a better understanding of the behavior of hedge funds returns, since hedge funds depend in large part on the spot prices and on the

factors that motivate mutual funds managers' strategies.
This approach to the behavior of mutual funds managers help us to report to the results of Agarwal et al. (2007), namely their last Hypothesis.

III. Data and Methodology

This study intends to determine whether seasonality exists across two of the most representative indexes of hedge funds, the EDHEC indexes[22] and the CSFB/Tremont indexes[23], regarding seven strategies[24] for the period of 1998 to 2008.
Our decision to use EDHEC Risk Alternative Indexes and the CSFB/TREMONT Indexes is based on Lhabitant's (2006) approach, who states that, according to many researchers and investors, they may even be classified as potential benchmarks.
EDHEC Alternative Indexes are able to capture a very large fraction of the information contained in the competing indexes (e.g. the average percentage of variance explained by the Indexes is 79.12% across all sub-universes).
EDHEC Alternative Indexes, generated as the first component in a factor analysis, have a built-in element of optimality, since there is no other linear combination of competing indexes that implies a lower information loss. Given that competing indexes are affected differently by measurement biases, searching for the linear combination of competing indexes that implies a maximization of the variance explained, leads implicitly to a minimization of the bias. EDHEC Alternative Indexes tend to be very stable over time and, as a result, easily replicable.

Insert Table I Here

CSFB/Tremont Hedge Funds Indexes' are compiled by Credit Suisse Tremont Index LLC. They are asset-weighted hedge funds indexes and include only funds, as opposed to separate accounts. The Indexes use the Credit Suisse/Tremont database, which tracks over 5000 funds, and consist only of funds with a minimum of US$50 million under management, a 12-month track record and audited financial statements. They are calculated and rebalanced on a monthly basis, and shown net of all performance fees and expenses. They are the exclusive property of Credit Suisse Tremont Index LLC.
Our data includes monthly returns from January 1998 to December 2008 (eleven years of monthly observations).

Insert Table II Here

An important remark should be noted regarding the CSFB/TREMONT information concerning the strategy of Equity Market Neutral's monthly returns. In November 2008, a major correction was made in this index, displaying a monthly return of about minus (-) 40%. Because this abnormal return could influence our results, we decided to compute two sets of data for this strategy: a first approach considers the real values and the second, expressly mentioned in Table III, considers the monthly return of November 2008 null.

Insert Table III Here

In financial mathematics, a time series is a sequence of data points measured typically at successive times spaced at uniform time intervals. A great part of a time series consist in discrete observations made at regular intervals of time. Accordingly to Pindyck and Rubenfeld (1997)

[22] Source: EDHEC RISK
[23] Source: CSFB/TREMONT INDEXES
[24] (1) Equity Market Neutral, (2) Long/Short Equity, (3) Convertible Arbitrage, (4) Event Driven, (5) Fixed Income Arbitrage, (6) Emerging Markets and (7) Global Macro. See Amenc and Martellini (2003) for a description of these alternative strategies.

time series analysis comprises models that no longer predict future movements in a variable relating it to a set of other variables in a casual framework, but instead makes the prediction based solely on the past behavior of the time variable. By looking at a time series past values it is possible to formulate conclusions about its probable future behavior. Using a time series model it is legitimate to search for patterns in the past movements of a variable and treat that information in order to predict its future movements. As stated by Pindyck and Rubenfeld (1997) seasonality is defined as a periodic behavior that occurs on a regular calendar basis. Recognition of seasonal peaks and downs is crucial as it provides information about "regularity" in the series helping to forecast. In our situation, it is detected by measuring the returns for monthly time intervals, for the total period of 11 years, with 132 observations. The description of the seasonal effect provides a better understanding of the impact that this component has upon a particular time series. Financial managers are often interested in knowing their performance relative to the normal seasonal variation. The moot point is whether the increase or decrease is more or less than expected.

If we accept the hypothesis that monthly returns through years are affected by **seasonal variation, we** need to identify and measure this seasonality to help plan the best possible BLASH strategy. It is useful to know if the past increases/decreases would be expected given the usual seasonal variations. Projecting the past patterns into the future knowledge of the seasonal variations is very helpful to predict the future trends.

We are going to assume that when treating the seasonal component, the impact of the seasonal component is constant from year to year.

Seasonal variation is measured in terms of a coefficient, called a seasonal coefficient, which is an average that can be used to compare an actual observation relative to what it would be if there had been no seasonal variation. An index value is attached to each period of the time series within a year. This implies that if monthly data is considered there are 12 separate seasonal indexes, one for each month. We will use the method of simple average to measure seasonal variations of a time-series data.

In the additive time-series model used, the seasonal component is estimated as:

$$S = Y - (T + C + I) \qquad (1)$$

where:

S= seasonal values

Y= actual data values of the time-series

T= trend values

C= cyclical values

I= irregular values.

Thus, the Additive Model is computed as follows:

$$Y - S = T + C + I \qquad (2)$$

We assume that this is an important methodology, which enables us to capture a general view of the seasonality present in the seven strategies considered. Through the use of two databases we assume that we are double checking the results.

IV. Empirical Results

It should be noted that since the period from August 2007 to December 2008 can be classified as an abnormal situation, in sequence of the sub-prime crises in USA, as well as the years of 1998 and following, due mainly to the debt market crisis, the results presented must be taken with

precaution. However, our aim is quite simple: to observe if hedge funds display higher or lower returns in some defined months of the year. To the first set of findings, we would like to consider the highest returns in the month of December.

Insert Table IV Here

Based on the results presented in Table IV, we can verify that the Seasonality coefficients present their highest values in December for five of the strategies, namely Global Macro, Event Driven, Emerging Markets, Equity Market Neutral and Long/Short Equity.

The exception here is clearly on two strategies regarding Arbitrage. The first Strategy, Fixed Income Arbitrage presents significant high Seasonality coefficients in April and the Convertible Arbitrage Strategy present significant high Seasonality coefficients in January.

The second set of findings we would like to mention consider the Seasonality coefficients that present negative values for the months of July, August and September for all of the seven strategies except for the two strategies of arbitrage mentioned above. Although the seasonality coefficients vary from strategy to strategy, we can state that the industry of hedge funds present in general negative seasonality coefficients for the months of July, August and September, and the two exceptions on arbitrage strategies presented significant negative values for the immediately following months, before or after. Note that in August the seasonal coefficients present negative values for all strategies.

A special reference should be made to the month of March since all strategies present also negative seasonal coefficients.

Insert Table V Here

Considering the CSFB database results in Table V, and regarding the December Spike, the CSFB database present positive significant values in December, for the strategies of Global Macro, Event Driven, Emerging Markets and Long/Short Equity.

The exceptions regard arbitrage strategies (Convertible Arbitrage and Fixed Income Arbitrage) and alpha strategies (Equity Market Neutral). For those months the highest coefficients appeared in January (0,957) for Convertible Arbitrage, in March (0,839) for Fixed Income Arbitrage and in June (0,319) for Equity Market Neutral.

Although the seasonality coefficients vary from strategy to strategy, we can state that the industry of hedge funds present negative Seasonality coefficients values for the months of July, August and September for four of the seven strategies, exceptions made, once again, for arbitrage strategies, pure alpha strategies and Long/Short Equities. The two exceptions on arbitrage strategies present significant negative values for the immediately following months, before or after, and Equity Market Neutral strategy presents significant negative value in August and September. The Long/Short strategy presents negative values for July and August.

Special reference must be made regarding the month of December, that present positive seasonal coefficients for all strategies, and the month of August, that present negative seasonal coefficients for all strategies. As we can verify the CSFB database present monthly returns more erratic than the EDHEC database, but in general, we can claim that it exists seasonality in the hedge funds industry.

V. Summary and Conclusions

Several different studies have demonstrated that seasonality behavior exists in different financial markets, especially in the spot market of equities and bonds. Seasonality in financial markets implies that in general there are greater/lower returns in some monthly periods than others. This allows the investor to buy during the monthly periods of lower returns and sell in the periods of

higher returns.
Our study demonstrates that Seasonality is present in the hedge funds indexes, based on monthly returns data.
Although some important Bias intrinsic in this industry, namely "Different Indexes, different performance Bias", imply slightly different results for the two databases indexes, it is possible to conclude that the December spike occurs frequently in almost every strategy studied.
Strong evidence was found for the December spike in the strategies of Global Macro, Event Driven, Emerging Markets and Long/Short Equity. The other three strategies present positive and significant seasonality coefficients in December, with one exception only: Convertible Arbitrage in the EDHEC Indexes data-base with the highest coefficient present in January.
To perform Blash strategies we studied also the lower values of the seasonal coefficients and we found that for all seven strategies studied, the month of August present negative seasonality coefficients and the most relevant values for most of the strategies. We could also state that the industry of hedge funds present, in general, negative seasonality coefficients values for the months of July, August and September.
We advise some deeper research over the arbitrage and market neutral strategies that present slightly different results. Considering all the above mentioned, our conclusions will be helpful to fund managers in obtaining higher performance without assuming undue risks. Therefore, it is our strongest conviction that the results presented here will be useful to market participants in support of the use of BLASH strategies in Hedge Funds Management.

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Table I EDHEC average returns (%) on the seven strategies (1998-2008)

	Global Macro	Fixed Income Arbitrage	Event Driven	Emerging Markets	Convertible Arbitrage	Equity Market Neutral	Long/Short Equity	Average
Jan	0,81909	0,74000	1,25727	0,81363	1,60000	0,66818	0,68727	0,94077
Feb	1,03363	0,78090	1,08818	1,95727	0,79090	0,82545	0,92636	1,05753
Mar	0,41727	0,16181	0,81272	1,18090	0,54363	0,65181	0,55363	0,61740
Apr	0,48454	0,82818	1,14090	1,22454	0,78636	0,60181	0,88818	0,85064
May	0,61818	0,76363	0,93090	-0,50000	0,56363	0,71636	0,51363	0,51519
Jun	0,68909	0,28909	0,60545	0,67909	0,16000	0,85363	0,78727	0,58051
Jul	-0,05636	0,35000	-0,08363	-0,24181	0,10545	0,28000	-0,37272	-0,00273
Aug	-0,04454	0,21727	-0,35181	-1,24545	-0,01000	0,18818	-0,16181	-0,20117
Sep	0,19636	-0,35363	-0,38000	-1,09090	-0,19272	0,31727	-0,08454	-0,22688
Oct	0,33363	-1,09363	0,17545	0,20818	-0,74090	0,48363	0,51272	-0,01727
Nov	1,30545	0,06454	0,85363	1,64363	0,45909	0,12090	1,34454	0,82740
Dec	2,22363	0,69000	1,31363	2,74181	0,67545	0,96636	2,11545	1,53233

Table II CSFB/TREMONT average returns (%) on the seven strategies (1998-2008)

	Global Macro	Fixed Income Arbitrage	Event Driven	Emerging Markets	Convertible Arbitrage	Equity Market Neutral	Long/Short Equity	Average
Jan	1,06818	0,76818	1,35727	0,28636	1,50545	0,85909	0,52272	0,90961
Feb	1,35000	0,69818	1,08818	1,76727	0,69181	0,72363	1,51909	1,11974
Mar	0,87727	-0,09909	0,89636	1,61818	0,30000	1,06090	0,50272	0,73662
Apr	0,49363	1,11818	0,99090	0,47636	0,96181	0,80909	0,48000	0,76142
May	1,33000	0,51181	0,93090	-0,97909	0,70272	0,90000	0,13181	0,50402
Jun	1,48727	0,24000	0,68727	0,78454	0,18727	0,71909	1,34363	0,77844
Jul	0,54272	0,19454	0,08454	-0,05545	0,11818	0,70636	-0,43545	0,16506
Aug	-0,36818	-0,05545	-0,63272	-1,73090	-0,11454	0,51363	-0,45818	-0,40662
Sep	-0,43363	-0,69818	-0,22363	-1,51909	-0,35000	0,32181	0,22727	-0,38221
Oct	-0,62090	-1,52363	0,28454	0,36545	-0,83363	0,62090	0,29727	-0,20143
Nov	1,33363	-0,12727	0,94727	2,02272	0,46545	-3,00727	1,50545	0,44857
Dec	2,55272	0,59636	1,19363	2,71636	0,55727	0,83818	3,30000	1,67922

Table III CSFB/TREMONT average returns (%) on the seven strategies (1998-2008), excluding the abnormal return of November 2008 for the Equity Market Neutral

	Global Macro	Fixed Income Arbitrage	Event Driven	Emerging Markets	Convertible Arbitrage	Equity Market Neutral	Long/Short Equity	Average
Jan	1,06818	0,76818	1,35727	0,28636	0,85909	0,52272	1,50545	0,90961
Feb	1,35000	0,69818	1,08818	1,76727	0,72363	1,51909	0,69181	1,11974
Mar	0,87727	-0,09909	0,89636	1,61818	1,06090	0,50272	0,30000	0,73662
Apr	0,49363	1,11818	0,99090	0,47636	0,80909	0,48000	0,96181	0,76142
May	1,33000	0,51181	0,93090	-0,97909	0,90000	0,13181	0,70272	0,50402
Jun	1,48727	0,24000	0,68727	0,78454	0,71909	1,34363	0,18727	0,77844
Jul	0,54272	0,19454	0,08454	-0,05545	0,70636	-0,43545	0,11818	0,16506
Aug	-0,36818	-0,05545	-0,63272	-1,73090	0,51363	-0,45818	-0,11454	-0,40662
Sep	-0,43363	-0,69818	-0,22363	-1,51909	0,32181	0,22727	-0,35000	-0,38221
Oct	-0,62090	-1,52363	0,28454	0,36545	0,62090	0,29727	-0,83363	-0,20143
Nov	1,33363	-0,12727	0,94727	2,02272	0,67000	1,50545	0,46545	0,97389
Dec	2,55272	0,59636	1,19363	2,71636	0,83818	3,30000	0,55727	1,67922

Table IV Seasonal Factors: EDHEC database

Period	Global Macro	Fixed Income Arbitrage	Event Driven	Emerging Markets	Convertible Arbitrage	Equity Market Neutral	Long/Short Equity
Jan	,24786	,38535	,55347	,24325	**,98591**	,00472	-,05452
Feb.	,32845	,31710	,13922	,76233	,11557	,11205	-,09927
Mar	-,80239	-,40557	-,20453	-,20284	-,17551	-,12061	-,53710
Apr	-,17122	**,39243**	,35855	,17108	,17874	-,03478	,12032
May	-,09072	,36193	,37422	-,73734	,08899	,08622	-,01818
Jun	-,02430	-,01007	-,02337	,22508	-,24759	,27130	,06873
Jul	-,71200	,04958	-,69848	-,89798	-,31697	-,29158	-1,02874
Aug	-,66764	-,24207	-1,17678	-2,07067	-,63776	-,34136	-,88685
Sep	-,23797	-,35482	-,58828	-1,24975	,14132	-,04811	-,25602
Oct	-,18139	-,77165	,05663	,58633	-,21326	-,08711	,40265
Nov	,69395	-,06598	,47747	1,21291	,14991	,05755	,86807
Dec	**1,61736**	,34377	**,73188**	**1,95758**	-,06934	**,39172**	**1,42090**

Table V

Seasonal Factors: CSFB database

Period	Global Macro	Fixed Income Arbitrage	Event Driven	Emerging Markets	Convertible Arbitrage	Equity Market Neutral	Long/Short Equity
Jan	,59235	,51033	,52872	-,03911	**,95679**	,02127	-,22057
Feb.	,70035	,27542	,17113	,82422	,00496	-,22206	,25210
Mar	-,84357	-,68792	-,12862	,33864	-,43821	,13477	-,88257
Apr	-,39399	**,83858**	,17363	-,52361	,38004	,04544	-,42457
May	,29251	,25058	,34855	-1,0370	,22296	,07935	-,45065
Jun	,45268	,09817	,08938	,44756	-,20921	**,31894**	,41626
Jul	-,20524	,02299	-,53928	-,56862	-,25318	,22526	-1,18089
Aug	-1,18507	-,45425	-1,4912	-2,3796	-,75496	-,23248	-1,26274
Sep	-,76357	-,53900	-,46803	-1,6518	,17037	-,35498	,09110
Oct	-1,02074	-,65600	,05997	,94889	-,26738	,03235	,15918
Nov	,48860	,01867	,60280	1,59297	,09196	-,09681	,90735
Dec	**1,88568**	,32242	**,65305**	**2,04764**	,09587	,04894	**2,59601**

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A Market Risk Model for Asymmetric Distributed Series of Return

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Abstract

In this paper we propose to model short-term interest rates by taking into consideration both the asymmetric properties of returns, using Pearson's type IV distribution, and the time-varying volatility, using GARCH models. We show that conditional skewness is negatively related to spot price interest rates and that negative conditional skewness can lead the process to generate steady returns.

Key Words: Short-term interest rates; Pearson IV; GARCH; Conditional skewness

I. Introduction

During the last two decades, a vast literature on dynamic volatility models as well its applications have shed light on forecasting speculative price changes and predicting their magnitude. There is a consensus that dynamic volatility models fit well with the properties of daily price changes of the speculative assets, namely volatility clustering. Starting with the seminal work of Engle(1), a family of dynamic models have been developed, known as (G)ARCH, that capture the clustering effect present in financial time series. Later the GARCH family volatility models have been enhanced in order to accommodate some additional properties like asymmetric volatility, i.e. negative returns and price crashes have a larger impact on the volatility increase than positive price changes (for reviews see Refs. 2, 3). Early GARCH type of models assumed that the conditional density of the error term was normal. This assumption was probably due to the computation simplicity offered by a conditional likelihood function offered by a normally distributed error term. However, the changing values of the second moment imply that the unconditional distribution of returns is leptorkutotic. This property, although conformed to the fat tails that characterize most of financial property changes, does not capture the entire tail characteristics. Further investigation, however, revealed that the empirical conditional density of financial time series is heavy-tailed and thus deviate from the normality assumption (for a short review, see Ref. 4). A second generation of ARCH models emerged where the normality assumption in the error term was either relaxed or replaced by a different density which allowed for heavier tails. One study suggested a GARCH model with t-distribution in the error term with the degrees of freedom being as a parameter itself and had to be estimated jointly with the others, in the variance and mean equation, parameters.(5) Another study recommended a semi-parametric ARCH model with non parametric density function for the error term.(6)

More recent developments in modeling the volatility of financial assets has introduced a further flexibility where the density of the error term is allowed to exhibit, in addition to fat-tail-ness (kurtosis), asymmetry (skewness). Jondeau and Rockinger(7) suggested that the error term follows a Gram-Charlier expansion where the skewness and kurtosis are directly appearing as a parameter. These densities present a major challenge in practice. In fact the set of parameters for which the densities is well defined (positive) is limited and far from obvious.(8) An improved model using entropy densities has been proposed(9) and where skewness and kurtosis appear as parameters of the model. Unfortunately no closed form of these densities is possible; they are only defined as solutions of some integral equations. Brannas and Nordman(10) considered GARCH models where the error follows either a Pearson IV or a log-generalized gamma distribution. In both models, the error density allows for changes in the skewness and kurtosis via the density parameters.

In this paper, we will investigate the applicability of the GARCH with a log-generalized gamma error density and Pearson IV for the short-term Yen interest rate. In fact, the behavior of short

term interest rates has been of major interest among finance scholars and understanding the dynamics of short-term interest rates is of fundamental importance for many financial applications. Among others, in the pricing of interest rate derivatives and designing hedging strategies, a number of researchers have investigated the link between macroeconomic variables and the short end of the yield curve (see for example Ref. 11). In finance, pricing fixed income securities and interest rate derivatives, designing hedging strategies, all depend on the dynamic behavior of the term structure of interest rate. In general, the existing models for pricing interest rate and bonds assume either that interest rates follow a random walk with constant volatility, or that interest rates are mean-reverting. However, what makes peculiar a series of short term interest rates are some distributional properties not common among other financial time series. Nevertheless, the most atypical property is a lower bound found when the rates are at such low levels like the current US dollar and Japanese Yen. Under these circumstances, the conditional density function is asymmetric truncated to the left. Therefore, there is a need to allow for fat tails, skewness and kurtosis in order to understand investors' behavior and their preferences for moments and its implications in risk management. Given this need, there is an increasing interest to study distributions that allow enough flexibility in accommodating broad range of distributional properties of the data observed in practice, with a particular eye on the Pearson's type IV distribution that covers a wide region of skewness-kurtosis plane (for a short review, see Ref. 12).

The main objective of this paper is to model short-term interest rates by taking into consideration non-normality of returns using Pearson's type IV distribution coupled with the GARCH model to account for dynamic volatility. Also, the model aims to build on previous work on interest rates modeling to show how negative conditional skewness could serve better evaluation short-term interest rates. The paper is organized as follows: Section 2 presents the methodology; Section 3 describes the data and presents the results; Section 4 concludes.

II. Methodology

Let Yt be the series of interest rates and Rt the series of log-returns given by Rt = 100 □ log(Yt/Yt−1). It is desired to investigate how well the returns fit the following model will allows for asymmetric error distribution and also allows for time varying skewness. The basic model can be written as follows:

Rt = μRt−1 + ut, (1)

ut = t ht,

where t follows a standard Pearson IV density with parameters (r,δ,a). Precisely, the density of t is given by

$$f_t(x)=c^{-1}\sigma\left(1+\frac{(\sigma x+\mu)^2}{a^2}\right)^{-(1+r/2)}\exp\left[-\delta_t \arctan\left(\frac{(\sigma x+\mu)}{a}\right)\right], \quad (2)$$

where, $\mu=-\delta_t a/r,\ \sigma^2=a^2(r^2+\delta_t^2)/(r^2(r-1))$ and $c=a\int_{-\pi/2}^{\pi/2}\cos(w)^r\exp(-\delta_t w)dw$.

Note that all the time variation in ft is introduced through the parameter δt. As argued in Brannas and Nordman (2003), the parameter δ is closely related to the skewness, therefore it chosen to introduce time variation in the skewness through this parameter in the following way:

δt = ω1 + α1Yt−1 + β1δt−1 (3)

The skewness of this distribution is given by $s_t = -\frac{-4\delta_t}{r-2}\sqrt{\frac{r-1}{r^2+\delta_t^2}}$.

One of the purposes of the GARCH models is to capture leptokurtosis in the data series that arise due to dynamic volatility. The volatility satisfies the classical GARCH equation outlined next.

$ht = \omega 2 + \beta 2ht-1 + \alpha 2ut2 -1$ (4)

We chose the Pearson IV density because it offers large degree of asymmetry and extensive tail behavior. In fact, for $\delta = 0$, the Pearson IV becomes the Student distribution. The parameter δ controls the degree of asymmetry and for positive delta the skewness is negative while it is positive for negative delta. The parameter r controls the tail behavior and small values of r indicate heavier tail.

Pearsons Type IV distribution appears to be a suitable candidate to estimate the unknown true distributions of the GARCH innovations fairly accurately. This distribution was first introduced in the GARCH context by Premaratne and Bera(13) for modeling asymmetry and fat-tail. Yan(14) also uses Pearsons Type IV distribution and adopts autoregressive conditional density (ARCD) models to accommodate time-varying parameters.

All parameters of the AR(1)-GARCH model with the Pearsons Type IV distribution are estimated by the method of maximum likelihood (ML). The ML estimation is carried out in MATLAB.

III. Data and Results

We will illustrate our methodology with the use of a numerical example. We collected daily rates for the three months Japanese Yen yield rates. Our data source is the International bond market and the data set in this study covers the period January 2nd 1995 until February 24th 2009. The three months yield series is among the most liquid among the range of maturities, it is characterized by volatility clusters and as we will show its conditional density is asymmetric. The level of short term yield reached historical lows during the above period separated by only few basis points from the, theoretical, zero bound. The time trend of the series is shown on figure 1.

In Table I we report the descriptive statistics of the return series. The kurtosis has a high value but for such a low level rates even small movements of the rates will look very excessive. As we can see, the skewness is positive and moderate which mistakenly can be interpreted as a tendency for the rates to go down. We believe that this could be due to the large negative movements during the first half of the period examined.

We estimated the conditional volatility model in Eq. 3 by maximizing the likelihood function. The parameter estimates with standard error and the t statistic are shown in Table II. The coefficient of the mean and the volatility equations are found to be significant and correlations at all lags are found to be in significant implying that the log return series are stationary. In fact, the results show that there is a highly significant autoregressive term in the mean equation, which suggests that there is an own-spillover of the mean of the short-term interest rate. In addition, all the coefficient s in the variance equation are significant. In addition to own past innovations (arch-effects), represented by the coefficient $\alpha 2$,there is a significant degree of volatility persistence, displayed by the coefficient β, an indication that large volatility increases do last at least the following day. The parameters w1, $\alpha 1$, $\beta 1$, in the conditional skewness, Eq. 4, determine the shape of the conditional skewness which is shown in figure 2. These coefficient are significant, with the exception of the coefficient $\alpha 1$, indicating that the skewness changes over time. Moreover, there is significance of the presence of heavy tails indicated by the parameter r.

The results clearly indicate that the change in the direction of trends in the yield rates has affected the dynamics of the return-volatility and displayed time-varying conditional skewness. In fact, the conditional skewness is negative within the time horizon studied. Moreover, looking at both Fig. 1 and Fig. 2, one could suggest that the 3-month interest rates are negatively correlated with the conditional skewness. The fact is that this correlation is indeed negative, -0.978, which suggests that the heavier the tail of the left side of the return distribution is the more the return process can generate steady returns. Hence, it is proposed to employ negative conditional skewness as part of the criteria to evaluate daily short-term interest rates, bearing that investors are aware about the conditional skewness. Therefore, the model proposed for this study could add value in helping understanding why investors could prefer negative skewness in contrast with the consensus in financial theory that investors prefer positive skewness. Under the rubric of behavioral finance, the model could be used to show how the utility of skewness, or the preference for negative skewness, could be relevant in financial markets trading fixed-income instruments that offer asymmetric properties.

IV. Conclusion

This paper proposes a model for the short-term interest rates that takes into consideration non-normality of returns using Pearson's type IV distribution coupled with the GARCH model to

account for dynamic volatility. The model builds on previous work on interest rates modeling and shows how negative conditional skewness could drive the interest rate return process to generate steady returns. This in turn could serve better the evaluation of short-term interest rates and could contribute in understanding the utility of skewness in investors' preferences.

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Fig. 1: Daily rates of Japanese 3-month interest rates from January 2nd, 1995 to February 24th, 2009.

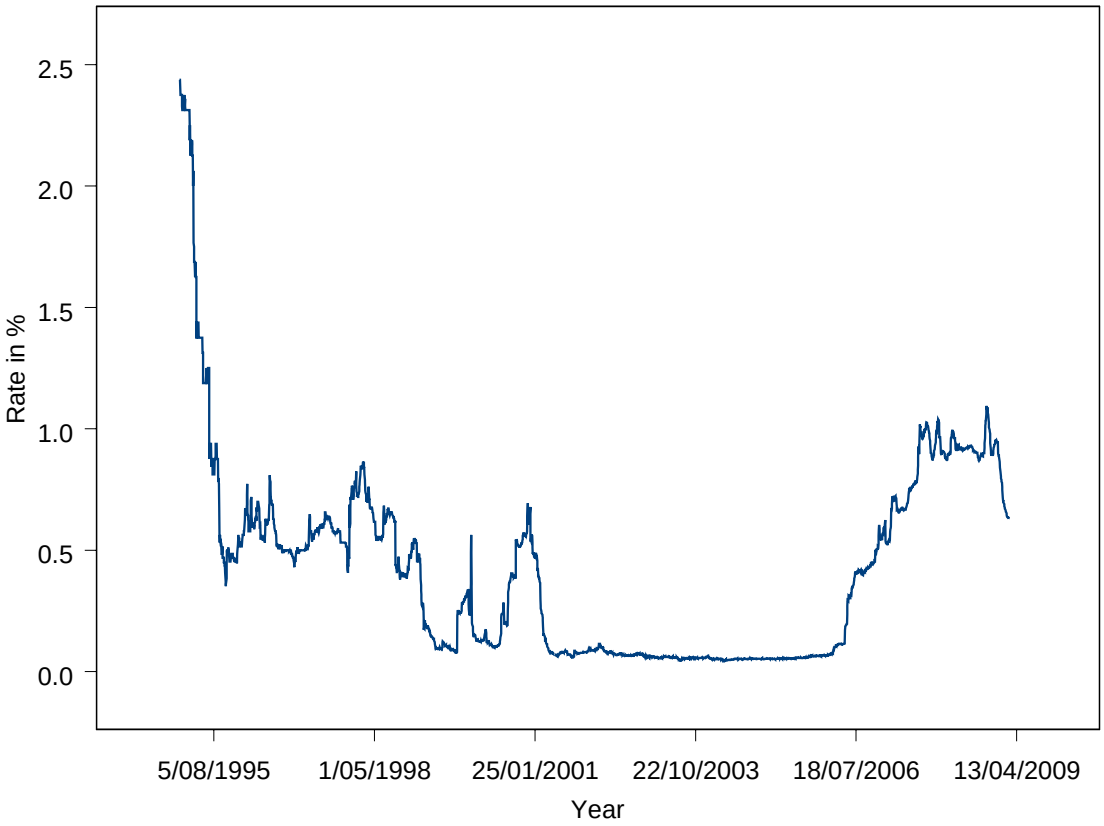

Fig. 2: Conditional Skewness.

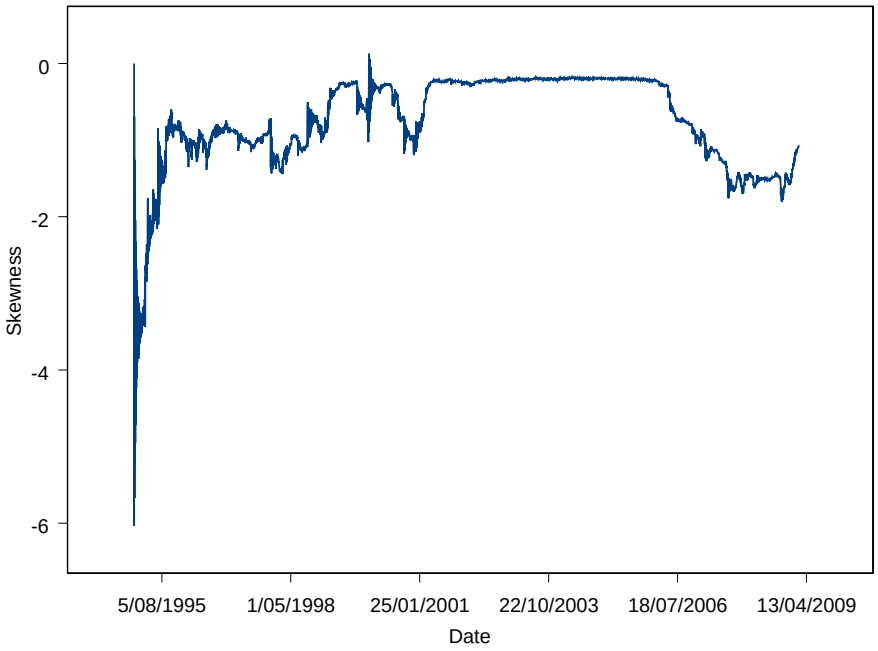

Table I: Descriptive Statistics of the return series (*5% significance level)

Mean	0.0004
SD	0.0456
Skewness	16.9547
Kurtosis	6.769
Maximum	1.7910
Minimum	-0.6444
Jarque-Bera	69135903*

Table II: Parameter estimate for Pearson IV GARCH model (*:1% significance level, **:5% significance level, ***:10% significance level)

Coe□cient	Value	T-Stat
μ	0.128	4.071*
w1	-0.241	−1.307***
α1	0.325	−0.854
β1	0.674	−1.988**
w2	0.205	8.052**
α2	0.325	10.325**
β2	0.674	49.141**
r	1.807	18.005**

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Editorial Board