In the pre-1984 period, while the R^2's have been both negative and positive, the bulk of the weekend effect occurred in active Monday trading. Smirlock and Starks (1986:209) interpret these results as meaning that the weekend effect has "moved up" in time - they do not venture any explanations for this phenomena.

Ariel (1990) has recently documented a further calendar related phenomena, viz. a "holiday effect". He investigates the returns and variances of stocks around holidays, using the CRSP equally and value weighted indexes for the period 1963-1982 (Ariel 1990:1612). The 5020 trading days in the twenty year period are divided into two subsections: pre-holiday trading days (160 days or eight days per year) and non pre-holiday trading days.

Ariel (1990:1613) reports that the ratio of returns for pre-holiday trading days and non-holiday returns are 8.9 and 14.0 for the equally weighted and the value weighted indices respectively. He further reports that while the holiday returns are greater than on other days that the variances are lower than on other days (Ariel 1990:1614). The greater return is not a reward for higher risk borne over that holiday period.

**4.2.2 ARE THE ANOMALIES RELATED TO EACH OTHER?**

In the previous section, the following anomalies were noted:
- size effects;
- P/E effects;
- January effects;
- monthly effects;
- weekend effects; and,
- a holiday effect.

What remains is to tie these effects into each other. The debate as to whether the size and P/E effects are related to each other has already been reviewed. In this section I will review that literature that ties the remaining effects into
Keim (1983) was one of the first researchers to investigate the interrelationships among anomalies. He (Keim 1983:14) investigates the stability of the size anomaly on a month by month basis, for the period 1963-1979. Keim (1983:16-19) begins his analysis by confirming the existence of the size effect. He then turns his attention to the seasonality of this phenomenon.

Keim (1983:19) states that the magnitude of the size effect is related to the month of the year. He states that fifty percent of the size effect occurs in January, of this twenty seven percent occurs within the first trading week.

In a similar vein, Keim and Stambaugh (1984:825-829) investigate the relationship between the size effect and the weekend effect, for the period 1963-1979. Their rationale for doing so is that Gibbons and Hess's (1981) results suggest that the magnitude of the weekend effect is dependant on firm size (Keim and Stambaugh 1984:825).

Keim and Stambaugh (1984:826) calculate the daily returns on ten market weighted portfolios. Their results are that Monday returns are negative for all portfolios. In addition, they (Keim and Stambaugh 1984:827) argue that there is no systematic relationship between size and Monday returns. They do find, however, that there is a relationship between firm size and Friday returns. From this observation, Keim and Stambaugh (1984:829) argue that the weekend effect could arise from upwardly biased Friday returns.

These two studies relate the January effect to the size and weekend effects. Rogalski (1984) advances the debate to the point where he investigates all three of these effects. Rogalski (1984:1608) investigates the daily returns of firms listed on the NYSE, divided into ten portfolios, for the period 1963-1982. He also divided the results into January and non-January periods.
Rogalski's (1984:1609-1611) results are unusual: he reports that Monday returns in January are positive for all portfolios. During non-January months, the Monday returns are negative. Secondly, he reports that in January, Monday returns are related to firm size. Rogalski (1984:1614) concludes by confirming that, "a large portion of the magnitude of the Monday/January/size effect occurs during the first five days of January". Rogalski (1984:1607) finds similar results with respect to holidays.

In this section, we have seen (briefly) that there is evidence that the anomalies are interrelated. The question that now needs to be answered is, "What does this mean?". Schwert (1983:9) writes that these anomalies point to a misspecification of the CAPM and inefficient markets. This sentiment is echoed by Keim (1986:31), however he does add that some of the anomalies need not necessarily be violations of the CAPM. After all, there may be perfectly valid reasons for these anomalies to be compatible with the CAPM.

We need to be aware of the fact that many of the tests that have given rise to the anomalies set out above, suffer from the defects that Roll (1977) warns of. There is little that can be done about this. However in the next section, I will attempt to establish whether or not the CAPM is compatible with the anomalies.

4.2.3 IS THE CAPM CONSENSUS WITH THE ANOMALIES

In the previous section, we saw that there seems to be a consensus of opinion that the CAPM is misspecified. Before we can accept that hypothesis, we need to investigate other possible explanations for the anomalies. Ritter (1988:701) states that there are various explanations that have been investigated in the literature. These include:

- an omitted risk-factor, i.e. the CAPM is misspecified;
- the tax-loss-selling hypothesis; and,
- an information hypothesis.
Of these explanations, only one is compatible with the CAPM: a tax-loss explanation would not invalidate the CAPM. The other explanations do invalidate the CAPM. In this section, I intend to review the literature in order to determine the approximate cause of the anomalies.

4.2.3.1 MISSPECIFICATION

Roll (1981:879) points out that if there is a persistent difference in returns between small and large firms then it can be concluded that small firms are riskier than large firms. The CAPM does not recognise this possibility as the additional risk is not reflected in the β. This implies one of two things:
- the CAPM is wrong; or,
- the β is understated.

Roll (1981:879) argues that before the former conclusion can be drawn that it is necessary to investigate an econometric problem associated with the latter. The econometric problem in question is one that is prevalent on the JSE - the impact that thin trading can have on statistical tests. Roll (1981:884) emphasises the point that it is not the risk of the security that is changed, but that it is underestimated.

Roll (1981:880) states that value-weighted and equally-weighted indices will exhibit differences as the latter will be "tilted" towards small firms. A comparison of the S&P500 to an equally-weighted index allows Roll (1981) to investigate the small firm effect. Roll (1981:880) investigates the risk measurements using daily, weekly, bi-weekly, monthly, bi-monthly, quarterly, and semi-annual measurement intervals. He finds that as the measurement interval increases, so the β and $\sigma^2$ of the indices change, despite the difference between the returns on the two indices remaining unchanged.

This result indicates that the risk of a portfolio of small shares is either related to the investment horizon of the investor or that small firm-β's are underestimated. Roll (1981:884) argues that the latter is correct, as thin
trading causes auto-correlation in returns. This auto-correlation arises because of the method of recording prices and does not have an economic meaning. Roll (1981:887) concludes by arguing that this mismeasurement contains the potential to explain the small firm anomaly.

Reinganum (1982) makes use of the Dimson approach to test this particular hypothesis. This approach is particularly useful in examining the problem of thin trading. Reinganum (1982:28) develops ten portfolios for the period 1964-1978 on the basis of size. He then calculates an OLS-β and a Dimson-β. The Dimson-β is calculated as follows:

\[ R_{kt} = \alpha + \sum_{k=1}^{n} \beta_{i,k} R_{m,t+k} + \epsilon_{kt} \]

This approach allows for lagged, contemporary and leading market returns to be regressed on observed security returns. A consistent estimate of β is obtained by aggregating the slope coefficients from this regression.

The results of this exercise (Reinganum 1982:29) show that the OLS technique implies that the small firm portfolios are less risky than large portfolios, while the Dimson-β's show the reverse. This is exactly Roll's (1981) prediction. Reinganum (1982) then attempts to determine whether or not this difference can explain the small firm effect in its entirety. He states that the differences in β's are too small to explain the differences in returns and concludes that the small firm effect is a significant economic and empirical anomaly (Reinganum 1982:35).

Given that risk mismeasurement cannot explain the small firm effect, James and Edmister (1983) investigate whether or not the premium on small firms shares can be explained in terms of a liquidity premium. James and Edmister (1983:1075) argue that firm size may simply be a proxy for trading activity. The economic rationale for a liquidity premium on small firms arises because trading costs and trading volume have an inverse relationship. James and Edmister (1983:1076) argue that in equilibrium all securities should have equal risk adjusted returns, net of transaction costs. They develop the
following testable hypothesis: if the firm size effect persists after differences in trading activity have been accounted for, then the anomaly does not arise as a result of a liquidity premium.

James and Edmister (1983:1077) investigate the relationship between trading volume (defined alternatively as number of shares traded and as number of trading days) and return for five hundred shares for the years 1975; 1977; 1978 and 1979. James and Edmister (1983:1079) calculate the following variables: daily return; an OLS-\( \beta \); a Dimson-\( \beta \); the median size of the portfolios and the trading values. They report that while trading volume and firm size are highly correlated that the bias in \( \beta \) does not appear to be large enough to explain the differences between small and large firms. This leads James and Edmister (1983:1081) to the conclusion that the small firm effect is not attributable to trading activity.

Based on the results of these latter two studies, it would appear that we are unable to avoid the conclusion that the CAPM is misspecified. While there is some evidence that the \( \beta \) is understated, it appears that this does not explain the small firm anomaly in its entirety.

4.2.3.2 TAX-LOSS-SELLING

The US has a tax regime that taxes both income and capital gains. The argument has been made that this tax regime explains the January-small firm effect. The US tax year runs from January to December. Just as capital gains are taxed, so capital losses can be used to shield income. Roll (1983:20) states that the effect occurs because investors are selling those stocks that have experienced a relative decline in value over the tax year in order to realise tax losses. In January the selling pressure eases and the shares return to their equilibrium values. This ties the January effect to the small firm effect, as small firms are more likely to have experienced a decline. Note that this argument does not violate the CAPM, however it would appear, at first, to
violates the EMH.

It is the fact that this argument seems to violate the EMH that leads Roll (1983:20) to argue that the tax-loss-selling argument "is ridiculous, of course". The EMH argument being that once arbitrageurs realised that there was a systematic seasonal pattern, they would exploit it and the pattern would disappear.

There are three reasons why the persistence of the January effect is not a violation of the EMH. The first reason being that the transaction costs associated with small firms are higher than with large firms (Roll 1983:23), it may not be possible to exploit price differentials after the transaction costs have been factored into the calculation. Indeed, Reinganum (1983:103) performs a rough calculation on transaction costs and concludes that, "the hypothetical dollar profits associated with these abnormal returns do not appear to be large and may vanish after transaction costs". The second argument in favour of the EMH is that it may be difficult for the arbitrageur to identify tax-loss candidates. Roll (1983:24) argues that unless the stock is trading at an all time low, that there will be some shareholders who have a capital gain with respect to the price that they paid. The third argument flows from chapter two, where the point was made that arbitruers may not wish to hold an overly unbalanced portfolio. The arbitruer would have to abandon his present portfolio and hold a portfolio that consists of small illiquid stocks. This may be undesirable even for the risk taking arbitruer. So while there may be *prima facie* evidence that the tax-loss-selling hypothesis violates the EMH, this is not necessarily true.

Despite the fact that Roll (1983:20) feels that the tax-loss-selling hypothesis is ridiculous, he develops a trading rule test to determine whether or not there is evidence in favour of it. Roll (1983:20-21) calculates two rates of return for those shares listed on the last trading day of December. The first return is calculated over the year excluding the first and last five days and the second
return is measured over the five day period beginning on the last trading day of December. Roll (1983:21) argues that if the tax-loss-selling hypothesis is true that there will be a negative relationship between these two returns. Using NYSE and AMEX data for the period 1962-1980, he finds this to be true.

Reinganum (1983) also tests the tax-loss-selling hypothesis. He develops a "measure of potential tax-loss selling (PTS)" (Reinganum 1983:92). This PTS is the ratio of stock prices on the second last day of December to the six month high, beginning in July. Once the PTS is calculated for each stock, it placed into a portfolio via two criteria, viz. market capitalization and PTS. Reinganum (1983:93) argues that this allows for tests of tax-loss-selling effects within a market value portfolios and for differences in tax-loss-selling between portfolios.

Reinganum (1983:94) reports that small firms tend to trade at low PTS's at the year end, whereas large firms trade at high PTS's. Thus it can be argued that size and PTS are related to each other. Reinganum (1983:95) also shows that the lowest quartile of PTS firms have the largest average returns in January. Due to the fact that Reinganum (1983:102) is unable to entirely eliminate the size effect after controlling for it, he concludes that the tax-loss-selling hypothesis can only explain part of the anomaly.

Further evidence in favour of the tax-loss-selling hypothesis can be found in Ritter (1988) who develops a "parking the proceeds hypothesis". He argues that the January effect is caused by the buying and selling behaviour of individual investors. In order for this hypothesis to be true, three conditions must hold:
- individuals should hold more small firms in their portfolios than do institutional investors;
- demand functions for stocks should not be perfectly elastic; and,
- investors, having sold their stocks do not immediately reinvest the proceeds.

\[52\] The six month period is used because of US tax considerations.
Ritter (1988:706) argues that if these three conditions hold, then there will be a seasonal pattern in returns.

In order to test his theory, Ritter (1988:707) investigated the daily buy/sell records of Merrill Lynch, Pierce, Fenner and Smith for the period 1970-1985. Ritter (1988:714) reports that forty six per cent of the variation in January is explained by his "parking the proceeds" model.

Ritter (1988:715) concludes that the evidence points to the fact that individuals sell stocks in order to realise the tax shield, park the proceeds in their brokerage account and in the new year reinvest the proceeds in a broad spectrum of small shares. This explains why Reinganum (1983) was unable to exorcise the small firm effect from his data ie. those stocks that are not candidates for tax loss selling also have a higher return in January.

4.2.3.3 THE INFORMATION HYPOTHESIS

An entirely plausible explanation for the anomalies is what may be termed an "information deficiency hypothesis". This hypothesis is similar to Roll's (1981) argument, but differs in one important manner. Instead of stating that the risk of small firms is understated, this hypothesis states that the risk of these firms is misspecified, i.e. the lack of information of firms is a source of undiversifiable risk which is not captured by \( \beta \). In his paper on the small firm effect, Banz (1981:17) states, "[i]t is likely that the amount of information is related to the size of the firm. Therefore, many investors would not desire to hold the common stock of very small firms.... [A]ack of information about small firms leads to limited diversification and therefore higher returns for the 'undesirable' stocks of small firms." (emphasis added).

Zeghal (1984:300) also argued that firm size can be considered to be a proxy for the amount of information available on the firm. He argues that there are sound economic reasons for this phenomena; the supply and demand for
information for small firms may differ from that of large firms. The supply side factors include economies of scale in production and storage of information; it may be cheaper for large firms to communicate with investors. Demand side factors also include economies of scale: professional investors and their advisors would wish to concentrate their resources in generating information on larger firms. In addition there are economies of specialisation which can gained by concentrating in larger firms. These supply and demand conditions give rise to the fact that more is known about larger firms than about smaller firms. This lack of information gives rise to what may be termed "estimation risk" (Klein and Bawa 1977). Estimation risk may be defined as the degree of confidence that the investor can have in the parameters which he has estimated for a particular security. Klein and Bawa (1981:101) demonstrate that when the investor faces estimation risk, he will invest in those securities about which he has the most information.

An intuitive explanation for this phenomena is provided by Arbel (1985). He likens the stock market to a product market (Arbel 1985:5). In the product market we find both brand name and generic products. In the stock market a brand name share would be one that is closely followed by the investment community and is traded on a regular basis. When the investor buys a brand name share, he is buying greater and additional information, less estimation risk and thus less uncertainty. A generic stock on the other hand, much like its product market counterpart is an unknown quality. The information that is available on this type of firm is far less than that of the brand name

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53 A moments reflection will indicate that this is not a violation of the EMH (as defined in chapter Two). As Zeghal (1984:300) points out more information is generated and known about large firms ie. the information set \( \Phi \) differs across firm sizes.

54 Arbel (1985:5) makes the argument that the investor is also buying greater monitoring in the firm, I am unsure as to whether this is a valid argument or not. I feel that institutional investors may not closely monitor the firms that they own.
stock. As such the level of confidence that can be expressed in the potential or expected return is less and as such, investors will demand a higher return for holding such stocks (i.e. they will demand a price discount). The most important point that Arbel (1985:5) makes is that the CAPM does not recognise the notion of informational deficiency.

This is an intuitively appealing argument. However two important questions arise:

- what empirical evidence exists for this argument? and,
- is this type of risk diversifiable, after all the only information that could give rise to information deficiency is firm specific information - which is diversifiable.

These questions can be answered by investigating the existing empirical literature.

Barry and Brown (1984:286-287) investigated this hypothesis for the period 1926-1980, using data from the NYSE (taken from CRSP). They made use of monthly data and formed portfolios on the basis of market capitalization, period of listing and $\beta$. Period of listing is used as a proxy for differential information. They report that period of listing appears to be related to the size effect but are unable to entirely explain that effect, but do allow that their proxy may be inadequate (Barry and Brown 1984:293).

Arbel (1985:6) presents results which link the small firm effect, P/E effect and the January effect to the information deficiency hypothesis. In doing so, he presents four hypotheses:

- degree of neglect is the cause of abnormal returns;
- information deficiency is the cause of the neglected firms or generic firm effect;
- abnormal returns are associated with information deficiency and estimation risk; and,
- information deficiency exhibits seasonal characteristics that can explain the
January effect.
In order to test these hypotheses, Arbel (1985:6) developed a data base of one thousand firms for the period 1978-1982. He uses three proxies for neglected (generic) stocks:
- the number of institutions holding the shares of the firm;
- the number of shares of the firm held by institutions; and,
- the product of the first two proxies.
The proxy which Arbel (1985:7) uses for estimation risk is the variance of analysts expectations of future earnings. These expectations were taken from the Institutional Brokerage Estimation System. Arbel (1985:6) makes use of correlation analysis and multiple regression to investigate the data. Arbel (1985:8-9) reports evidence in favour of each of these hypotheses.

The argument made by Arbel (1985:9) regarding the seasonality of informational deficiency is of interest. He reports (Arbel 1985:9) that the January effect is stronger for generic stocks than for brand name stocks. The reason he gives for this is that information is seasonal. In the US most firms have their financial year ending in December. Generic firms would at this point release accounting information, the value of this accounting information is greater to the shareholders of a generic firm than to the shareholders of a brand name firm. (This point has been corroborated by Zeghal 1984.) The estimation risk at this time would decline and as such the abnormal return should also decline (price would increase).

At this point it should be safe to conclude that there is something to be said for the information deficiency argument. We must establish, however, whether or not this deficiency is a source of systematic risk. Using a variant of the CAPM, Barry and Brown (1986) report that information deficiency impacts upon the β estimate of shares. As such it appears that information deficiency is a source of non-diversifiable risk. This supports the findings of Klein and Bawa (1977:101) who argue that as a result of estimation risk, investors should tilt their portfolios towards those securities about which they have the
4.2.4 CONCLUSION

Having investigated the literature on three of the most common explanations for the anomalies, we can see that each does not entirely explain the anomalies. However, it is possible that taken together, they would explain the bulk of the anomalies. It would seem safe to conclude that the CAPM is misspecified - that β does not explain the entire risk-return relationship. There do appear to other factors which are systematically related to return. We are able to conclude that do appear to be serious cracks within the CAPM and the external consistency of the theory is violated.

4.3 THE EXISTENCE OF ANOMALIES ON THE JSE

Empirical research into the nature of capital asset prices on the JSE has only recently become popular. The bulk of the empirical work has been conducted at the University of Cape Town. In 1987, Seneque (1987) was unable to report many empirical studies relating to the JSE. A short two years later, Bradfield (1989) was able to reference a great deal of empirical work.

The results of that empirical work has been quite surprising. With few exceptions most researchers have reported that the various anomalies that appear to present on the NYSE are absent from the JSE. At present, no reason for the difference has been offered.

In keeping with the order that the anomalies were introduced in section 4.2.1 here we will discuss the size effects first and then we will look at calendar effects.

At present three papers on the size effect have been published in SA. Two of these papers are in general agreement. de Villiers, Lowings, Pettit and Affleck-
Graves (1986:192) investigate the small firm effect using three proxies for size:
- market capitalization;
- asset base; and,
- traded volume.
As it appears reasonable to assume that gold shares on the JSE are significantly different from industrials, they only investigate the JSE Actuaries Industrial Index for the period 1973-1982. They report (de Villiers et al. 1986:193) that the evidence is inconsistent with the small firm hypothesis. Indeed, they find that the performance of large firms is superior to that of small firms, for all three proxies. The lack of a small firm effect is corroborated by Bradfield, Affleck-Graves and Barr (1988) and Page and Palmer (1991).

In addition to confirming the lack of the small firm effect, Page and Palmer (1991) report the existence of a P/E effect. Page and Palmer (1991:65) investigate company data taken from the I-N-T service and monthly share price information from a UCT data base for the period 1978-1988. Page and Palmer (1991:70) report that they differ from de Villiers et al. (1986) in one respect: they find no evidence of a large firm effect. Page and Palmer (1991:71) find evidence of a P/E effect. They state that had an investor held low P/E shares, he would have earned an abnormal return of six and one half per cent per annum. Page and Palmer (1991:71) conclude their paper by arguing that the P/E anomaly is as a result of market inefficiency and not necessarily proof that the CAPM is misspecified.

Calendar anomalies have been investigated in several papers. Bhana (1985) was the first person to investigate a CAPM anomaly on the JSE. Bhana (1985:8) investigated JSE returns for the period 1978-1983. Using the same methodology as French (1981) he found evidence in favour of the Monday effect. A potential flaw in Bhana's (1985) methodology is the use of returns that have not been adjusted for dividends. Using the ALSI for the period 1986-1991