Taxation Influences upon the Market in Venture Capital Trust Stocks: Theory and Practice

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Abstract - Individuals investing in a Venture Capital Trust IPO listed on the London Stock Exchange receive a number of conditional tax incentives; the time related nature of the associated conditions can create a 'lock-in effect'. By deriving and testing a model of the value of these incentives we examine how they influence investors' pricing and trading decisions. This paper contributes to the ongoing tax capitalisation debate in three ways: first, by calculating the magnitude of the lock-in effect without reference to underlying shareholder records; second, by adopting a time series approach in view of the time varying magnitude of the potential lock-in effect, and thereby avoiding control issues involved in cross-sectional analysis of the effects of taxation on pricing; and third, by focusing on changes in the bid-ask spread rather than, for example, mid price, so reducing the impact of changes in the market value of the instruments under consideration on the analysis. Our results have direct policy implications in suggesting a conflict between the existence of time related conditional tax incentives and the requirement for VCTs to be listed on the London Stock Exchange explicitly in order to promote liquidity in a historically illiquid sector of the market.

Keywords: venture capital trust; taxation; relief; lock-in effect; listing

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1. Introduction

Successive UK governments, like their counterparts in the US, The Netherlands and elsewhere have attempted to use tax-based incentives to correct a perceived market failure in the provision of finance to small, unquoted companies. One such scheme in the UK promotes the use of Venture Capital Trusts (VCTs). An explicit aim of the VCT legislation is the provision of an exit strategy to investors thereby reducing one

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source of the potential market failure (HM Inland Revenue, 2002). Consequently, VCTs are required to be listed on the London Stock Exchange. We report, however, that the secondary market in VCT shares is characterised by low levels of market liquidity as indicated by typically low trading volumes. This paper examines whether investors' pricing and trading decisions can be explained in terms of tax considerations and, therefore, whether the design of the VCT legislation (and associated tax legislation) is a potential cause of the low liquidity.

Individuals investing in a VCT IPO receive a number of conditional tax incentives including, most significantly, 'investment relief', an income tax rebate based on the sum initially invested. To reduce the potential benefits of 'tax avoidance', a repayment or 'clawback' of the rebate can arise if the shares in the VCT are sold within a 'required holding' period (HM Treasury, 2003). This paper derives a model of the present value of the conditional tax incentive during the currency of the required holding period, and then tests empirically a number of predictions about market behaviour based on this model.

The issue of the impact of taxation on asset prices has been subject to considerable academic investigation. There remains, however, a lack of consensus over, in particular, the impact of investor level taxes share prices. A main source of the controversy revolves around identifying the tax status of the price setting or marginal investor. Further difficulty arises from distinguishing between competing effects. For example, in studies of UK markets, while Ang et al. (1991) and Chui et al. (1992) conclude that investor level taxes are reflected in gross yields, Morgan and Thomas (1998) dispute the validity of a tax-based explanation, suggesting dividend signalling effects and a delayed related price reaction as alternatives. The lack of consensus internationally on the impact of investor level taxes is evidenced in Harris and Kemsley (1999), Harris et al. (2001), Collins and Kemsley (2000), Dhaliwal et al. (2003) and Hanlon et al. (2003). More fundamentally, questions pertain as to the efficiency of markets with respect to taxation. In studies of US markets, Cutler (1988) concluded that 'results leave unanswered questions about … whether [tax] news was efficiently incorporated into stock prices'; and Elton et al. (2004) found indications that 'individuals either do not pay attention to taxes or are unaware of the differences across funds and their predictability'. Hubbard and Michaely (1997) raised similar concerns.

We address the effect of investor level taxes by examining their influence on disposal timing decisions and the resulting effect on price, i.e. investigating the existence and extent of a 'lock-in effect'. Such an effect typically arises when the taxation of gains is on a realised basis and, consequently, provides investors with an incentive to defer realisation of the gain (Devereux and Freedman, 2008, Stiglitz, 2000). In the context of capital gains tax in the UK, a lock-in effect may be exacerbated by the availability of taper relief, which reduces the effective rate of tax with reference to the length of ownership. Lock-in effects can arise in other tax settings, for example, under corporation tax settings in the context of disposal of assets on which capital or investment allowances have been granted; or in the context of the decision as to whether or not to continue trading where there exist past trading taxation losses which are yet to be utilised.

Although studies find evidence of pricing consequences of a lock-in effect, e.g. Klein (2001) and Blouin et al. (2002), such studies necessarily rely on assumptions about the date of asset acquisition in order to estimate the tax cost of the lock in effect associated that a particular asset (although an exception is Landsman and Shackelford, 1995, who had access to confidential shareholder records which allowed them to calculate shareholder-specific tax liabilities by specific shareholder). However, the structure of VCTs in the UK allows a research methodology which overcomes the above limitations as discussed below. In other setting to overcome the above limitation regarding a pricing effect, more recent research has focused on relative trading volumes to find evidence of a lock in effect, e.g. Ayers et al. (2008).

Our analysis of bid-ask spreads confirm the existence of a lock-in effect, consistent with findings of low trading volumes, and have direct policy relevance on two aspects. First, the resulting disincentive to trade reduces liquidity, thereby potentially reducing VCTs' ability to attract funding and increasing their cost of capital; and second, the lock-in effect inhibits VCT investors from re-investing in more profitable activities, thus creating a welfare loss (Stiglitz, 2000) and related increased agency costs.. The results may be summarized as follows. First, VCT bid-ask spreads evolve over time in a way consistent with investment relief being capitalised, and the bid-ask spread increases as the present value of the investment relief increases. As the present value increases over time, VCT shareholders require an increasingly higher price if they are to sell within the required holding period and, thus, forfeit their investment relief. Potential secondary market purchasers, however, are not entitled to investment relief and are, therefore, only willing to pay a price that is independent of any investment relief consideration. Second, VCT spreads fall significantly and the number of customer bargains increases significantly following the end of the required holding period, consistent with the cessation of the lock-in effect. Third, spread is greater for VCTs with a three-year as opposed to a five-year required holding period, consistent with the present value of the investment relief being higher the shorter the holding period. And fourth, VCT spread and volume traded are, respectively, greater than and less than spread and volume traded for a non-VCT comparator sample (for which comparator sample, in the absence of specific tax incentives, there is no tax-related required holding period). We argue that our results present stronger evidence of a lock-in effect than do many previous studies, this being facilitated by the setting for our work.

In addition to its policy relevance, our study contributes to the lock-in literature principally in three respects. First, we calculate the magnitude of the lock-in effect with certainty, yet without reference to underlying shareholder records, which allows examination of a broader sample than would be likely to be available were access to confidential shareholders' records required. Second, we adopt a time series approach, in view of the time varying magnitude of the potential lock-in effect, and thereby avoid control issues involved in cross-sectional analysis of the effects of taxation on pricing. And third, we focus on changes in the bid-ask spread rather than, for example, mid price, and so reduce the impact of changes in the market value of the instruments under consideration in the analysis.

The paper proceeds as follows: the next section discusses VCTs and associated taxation regulation; the third section develops a theoretical model for the valuation of VCT investment relief; the fourth section

describes the data, hypothesis and research method; the results are presented and discussed in the fifth section; and the final section concludes.

2. Legislative and institutional background

Legislation establishing VCTs was included in the UK Finance Act 1995, and the first VCT was created in November 1995. The term 'trust' is, strictly, a misnomer, since, in order to be approved as VCTs under the Finance Act 1995, they are required to be public limited companies quoted on the London Stock Exchange.[1] Approval under the 1995 Act results in two distinct sets of tax reliefs: shareholder-level reliefs and firm-level reliefs. Critical to this analysis, shareholder-level reliefs are restricted to private individuals, thereby excluding the possibility that the (rational) marginal shareholder could be a tax-exempt organisation, since such organisations would be unwilling to pay a share price subsuming shareholder-level reliefs which are of no value to them.[2] The terms of approval are given in S.70, Finance Act 1995, and are primarily concerned with the composition of the assets held by the VCT[3], size of holding[4] and size of companies in which it invests.[5] The legislation also specifies approved trades, in order to direct investment away from relatively low risk asset-backed investment ventures towards risky activities which may, otherwise, experience difficulty in attracting investment.

The requirement that all VCTs must be quoted on the London Stock Exchange is designed to provide investors with a ready market for assets with typically illiquid underlying investments and thereby reduce the risks associated with unquoted investments.[6, 7] Individual investors may obtain a number of tax reliefs when investing in VCTs. Original subscribers (but not secondary market purchasers) can obtain income tax relief at a rate of 20 percent on the cost of their original investment (referred to as 'investment relief' for the purposes of this paper) conditional upon the shares being held by the individual for a required holding period. This required holding period was originally five years, but was reduced (non-retrospectively) to three years for seasoned and unseasoned issues occurring on or after 6th April 2000. If the shares are disposed of before the expiration of the required holding period a 'clawback' of the income tax occurs, based on the lesser of the amount invested or disposal proceeds. Additionally, a subscription to acquire VCT shares can, subject to certain conditions being satisfied, be used to defer a tax gain realised on a non-VCT asset. Following the introduction in the UK Finance Act 1998 of taper relief (for capital gains tax calculation purposes), the ability to defer a gain is now of less significance to potential investors, particularly in relation to gains on business assets. [8]

Further relief is given by an exemption from capital gains tax in respect of any gain on disposal of shares in VCTs, and by exemption from income tax upon dividends received from VCTs. For the purpose of this paper, these two reliefs are together referred to as 'return reliefs'. The return reliefs are available to all individual UK tax paying shareholders[9], irrespective of whether they acquired their shareholding by direct subscription or by purchase in the subsequent secondary market.

Therefore, in subscribing for shares in a VCT an investor is acquiring four distinct assets or rights: (i) a share of the VCT's net assets; (ii) the right to investment relief; (iii) the possibility of roll-over relief; and (iv) the right to return reliefs. Of these, the second and third cannot be acquired by a secondary market purchaser.

Since a subscriber forfeits the right to investment relief upon selling VCT shares within the required holding period, and since investment relief may not be transferred to purchasers in the secondary market, we deduce that the secondary market in a VCT share will be characterised by high bid-ask spread and low trading volume during the required holding period for that share. A market maker will only offer to sell VCT shares for a price at which he/she can readily obtain (or replace) such shares in the market: this price will include, to some extent, an element reflecting the value of investment relief rights of original subscribers. Potential purchasers, by contrast, will place no value on investment relief and will not be prepared to pay for it. Once the required holding period for the share is over, we may expect to see a lower bid-ask spread and consequently higher trading volume.

We would expect, therefore, that the quoted prices for VCTs in the secondary market to comprise the following elements: market value of underlying VCT assets; conventional discount (or premium) upon the market value of underlying assets, as per the literature on investment trusts in general; expected value of return reliefs; conventional market makers' spread; and spread attributable to the expected value of investment reliefs.

Table 1 sets out the number of VCT share issues by fiscal year since 1995/96, split for 1997/98 onwards between issues of VCT shares new to the market, and those which are further issues of pre-listed shares. An economically significant amount, over £3.3 billion, has been raised by the issue of VCTs new to listing and (typically smaller value) further issues; and the UK government provided £60 million in 2008/09 (£80 million in 2007/08) for example in respect of the loss of income tax in respect of venture capital trust relief (HM Treasury, 2009a). The government has stated that VCTs, along with certain other investment vehicles, 'remain a vital component of the Government's strategy to support investment' and that the UK government 'is confident that they will continue to encourage substantial investment into small companies which is vital to our economic recovery' (HM Treasury, 2009b).

***** insert Table 1 about here *****

The apparent importance of the tax benefits to shareholders is evidenced in that almost a quarter of VCT share issues occurred between the beginning of March and 5th April, late in the fiscal year, reducing uncertainty over individuals' tax positions and marginal tax rates, and also minimising financing costs. Based on a survey of 496 VCT investors, 'the single most attractive feature' of the scheme is the income tax relief based on the initial subscription (41% of investors) followed by the CGT deferral (23% of investors); whereas the income tax exemption on dividends and the CGT exemption on disposal of shares in VCTs were described as 'the single most attractive feature' of VCTs by 4% and 18% of investors respectively (PACEC, 2003).

3. Valuation of VCT investment relief

We turn now to the formulation of a theoretical model for valuation of investment relief. Consider an individual investor, UK resident for taxation purposes, who subscribes amount I in a VCT at time t_0 during fiscal year FY_0, on which amount he/she expects income tax relief at rate T_0

The value of investment relief is not certain to the investor until the end of the required holding period since, for example, the investor's circumstances may change and he or she may become a distressed seller. Suppose that:

(i) the risk free rate is f per time period

(ii) personal taxation payable in respect of fiscal year FY_i is due at time t'_i (in the UK, personal taxation is payable by 31st January following the fiscal year to which the tax relates)

(iii) the rate of interest upon tax 'clawed back' in respect of tax reliefs previously enjoyed but, retrospectively, no longer allowable is c per period (simple interest, as under tax legislation) and

(iv) the rate per period which represents the discount rate for risk appropriate to investment relief is r

The cash flow benefit of investment relief is, therefore, IT_0, to be enjoyed at time t'_0. The value of this investment relief to the investor in the period before he/she receives the cash flow benefit is the expected benefit appropriately discounted. In the period after receiving the cash flow benefit, but whilst still within the required holding period, the value is the potential liability for overdue tax (i.e., the cash outflow which will be suffered should the VCT holding be sold)[10]. Once beyond this holding period, the value disappears.

The VCT subscriber, however, might divest the holding (or part thereof) before the end of the required holding period for a price which is below the original subscription price. In such a case the 'clawback' of investment relief is restricted to divestment proceeds at the income tax relief rate previously enjoyed, plus interest. So in the period between point of cash flow benefit and end of the required holding period, the valuation of investment relief is not based, necessarily, on the amount originally invested, I; but, rather, on the lesser of this and the bid price, P_{bid}, at the time of divestment; that is, on $min(I, P_{bid})$.

More formally, the value of investment relief, which we denote VIR, is as follows over three periods (period from point of investment up to point of cash flow benefit; period between point of cash flow benefit and end of the required holding period; and period from end of the required holding period):

$$VIR = \begin{cases} \dfrac{IT_o}{(1+f)^{\{t'_0 - t\}}(1+r)^{\{t_0+NY-t\}}} & for\ t \le t'_0 \\ \min(I, P_{bid})\dfrac{T_o(1+c\{t-t'_o\})}{(1+r)^{\{t_0+NY-t\}}} & for\ t'_0 < t < t_o + NY \\ 0 & for\ t \ge t_0 + NY \end{cases} \quad (1)$$

where $\{b-a\}$ represents the number of discounting/compounding periods from time point *a* to time point *b* (so, for example, $\{t'_0 - t\}$ represents the number of days from point *t* to the point of enjoyment of the cash flow benefit of investment relief); *Y* represents the number of discounting/compounding periods in a year; and *N* represents the length in years of the required holding period. Notice that in the period prior to t'_0 no adjustment is made in respect of restricted clawback, since there is a zero assumed clawback during this period (the investor is assumed not to have claimed/enjoyed the cash benefit of investment relief). This leads to the profile of investment relief valuation over time as shown in Figure 1 (which figure, for simplicity of profile, assumes that the bid price is always in excess of or equal to the initial subscription price). In the figure, the height of the profile at time t_0 (vertical axis intercept) represents the value of investment relief, according the above model, at the point of investment in the VCT.

***** insert Figure 1 about here *****

The middle section of model (1) may be rewritten to separate out the limitation in *VIR* attributable to P_{bid} falling below *I*, decomposing *VIR* into (additive) parts *VIRA* ('full' *VIR*) and *VIRB* as follows:[11]

$$VIR = VIRA + VIRB \qquad for\ t'_0 < t < t_o + NY$$

where :

$$VIRA = I\frac{T_o(1+c\{t-t'_o\})}{(1+r)^{\{t_0+NY-t\}}}$$

$$VIRB = (P_{bid} - I)\frac{T_o(1+c\{t-t'_o\})}{(1+r)^{\{t_0+NY-t\}}} \text{ if } P_{bid} < I;\ VIRB = 0 \text{ otherwise} \quad (2)$$

We now consider what the proceeds of sale are likely to be in the context of market maker's bid or offer prices. The 'standard market maker's spread' covers the market maker's transactions costs, adjustment for operational risk, normal profits, *etc*. The market maker must post bid and offer prices at which he/she is prepared to trade. Faced with a buy order, the market maker must obtain shares and cannot, in the normal course, rely upon finding a financially distressed seller willing to part with his VCT shares without being recompensed for the value of investment relief. Therefore the offer (as relative to the bid) price will include not only standard market maker's spread, but also a valuation of investment relief. Conversely, the market

makers bid price reflects the fact that he anticipates selling VCT shares onwards on the secondary market to an investor who will not be able to enjoy, and therefore does not value, investment relief.

The valuation of market maker's bid/offer spread (which we can observe) follows from the above as:

$$VIR + \text{standard market maker's spread} \quad (3)$$

A further impactor upon the theoretical model might be the valuation of roll-over relief available to VCT subscribers. This may also be valued, along with investment relief, within the overall market maker's spread, and abstracting from this may mean that model (3) under estimates market maker's bid/offer spread. Roll-over relief value is, however, highly investor specific and difficult to estimate. It is also likely to be at least an order of magnitude lower than the value of investment relief (being the discount rate in respect of payment deferral applied to a tax rate in turn applied to a principal sum).

4. Data, hypotheses and methodology

4.1 Data set

The determination of the data set was influenced by the necessity for sufficient within-VCT-required-holding-period data points. For each VCT, such points commence approximately ten months after the end of the tax year in which the VCT is established.

The entire population of VCT shares which had been listed up to and including January 2008 was extracted from the *Primary Market Fact Sheet* published monthly by the London Stock Exchange, double checked against TrustNet, Reuters and Datastream databases. This provided a sample of 137 VCT shares.[12]

For every LSE-traded instrument for each VCT in the sample, all available daily data from 27th August 1996 to 25th March 2008 (inclusive) for market maker's closing ask price (which we denote *PA*), market maker's closing bid price (*PB*), number of customer bargains and number of shares traded in customer bargains were obtained direct from London Stock Exchange, through bespoke interrogation of LSE databases by LSE staff.[13]

Although VCTs have a number of unique characteristics, there are some financial instruments which invest in similar areas and are listed. Two comparator samples of listed investment trust stocks were selected by searching the TrustNet database: searching for 'UK Venture/Development Capital' investment trusts yielded fifteen trusts; and searching for 'UK Equity Growth' investment trusts yielded 27 trusts. All available daily data items as above were collected for these comparator samples.

For each sample VCT, its listing date was established from the LSE *Primary Market Fact Sheets* and the date of the end of the required holding period deduced. Where multiple allocations of a single VCT share class were made, the date of the first listing date was taken as the subscription date in order to maintain an assumption that market makers are rational and would not wish to under value the spread; and where a single VCT had multiple LSE-listed shares, the first subscribed was retained in the VCT sample. Where a single comparator had multiple LSE-listed shares, that with the longest time series of observations available was retained in the comparator sample.

For each sample VCT and comparator, the price spread was calculated for each day upon which bid and ask price data was collected:

$$SPREAD_t = PA_t - PB_t \qquad (4)$$

The samples were then trimmed of observations where either *PA* or *PB* was zero, or where *SPREAD* was negative (i.e, observations with no economic rationale). Further, the comparator samples were trimmed of observations where *PB* was less than one pence.[14] The final VCT sample comprised 108 VCT shares, with an aggregate of 148,628 daily observations for *SPREAD*; the venture/development capital comparator sample comprised fifteen shares with an aggregate of 26,442 daily observations for *SPREAD*; and the equity growth comparator sample comprised 27 shares with an aggregate of 44,489 daily observations for *SPREAD*.[15]

4.2 Hypotheses

The special taxation treatments associated with VCTs, and the 6th April 2000 non-retrospective reduction in required holding period from five years, provide a context in which we may formulate and test hypotheses concerning the impact of tax considerations on valuation and market behaviour. The null hypothesis in each case is one of no such impact.

Given valuation of investment relief by initial subscribers, we hypothesise as follows:

> *Hypothesis A:* The bid-ask spread of VCTs within the required holding period is higher than that for conventional investment trusts.

Since investment relief is forfeit if a subscriber sells their VCT holding within the required holding period, and trades in this period are, therefore, likely to be infrequent:

> *Hypothesis B:* The volume of VCT shares traded within the required holding period is lower than that for conventional investment trusts.

Since investment relief is certain for the subscriber as from the end of the required holding period:

Hypothesis C: The bid-ask spread of VCTs falls immediately at the end of the required holding period, and remains at lower levels thereafter.

Also since investment relief is certain as from the end of the required holding period, i.e., is not forfeit is if a subscriber sells their VCT holding, trades are likely to be more frequent after the end of the required holding period than they are within the required holding period:

Hypothesis D: The volume of VCT shares traded after the end of the required holding period is higher than during that during the required holding period.

From our modelling in the previous section, and focussing upon the magnitude (rather than merely the existence) of a pricing effect:

Hypothesis E: The bid-ask spread of VCTs includes a valuation of investment relief which is characterised by the theoretical modelling in the previous section.

At the date of subscribing in a VCT the present value of the conditional investment relief will be higher the shorter the required holding period, because of the discounting process; and given a shorter required holding period, *ceteris paribus*, the valuation of investment relief during the early life of a VCT will be higher:

Hypothesis F: The bid-ask spread over the first three years of the required holding period of VCTs subscribed prior to the reduction in required holding period (from five to three years) is less than the bid-ask spread over the required holding period of VCTs subscribed after the reduction.

4.3 Methodology

We commence by observation of the evolution of the mean SPREAD variable for VCTs in relation to the period to/since the end of the required holding period; and test for a structural break at the end of the required holding period as suggested by our hypotheses *C* and *E*.

Next, we consider in more detail descriptive statistics upon spread and volume data for our samples, segmented in various ways, and undertake comparison of means between various subsamples. This includes descriptive statistics and comparable estimates for our comparator samples: although we may not assume that the comparators provide a perfect control, they are sufficient for the limited objective of comparing the general size of spreads and the amount of trading activity.

We then undertake regression analysis aiming to model *SPREAD*, subsuming valuation of investment relief per our theoretical model. The objective of this analysis is to examine whether or not VCT spread evolves over the course of the required holding period in the manner anticipated and also whether or not the spread for VCTs is influenced by other factors in a manner similar to that for other stocks/investment

vehicles. This section now continues with discussion of development of our sample for regression purposes and of development of a reasonable, estimable regression model.

The value of investment relief variable *VIR* was computed by reference to the model developed in the previous section. This describes the theoretical valuation of the investment relief, including adjustments for the rate of interest applied on overdue (clawed back) tax.

We must account also for other factors which may further affect the bid-ask spread. Stoll (1989) decomposes the spread on stocks into three factors: those related to adverse information, to the costs of holding inventory and to costs of processing orders. This is corroborated by Glosten (1987), who decomposes the spread into portions attributable to information asymmetry and 'other' elements (encompassing the factors of Stoll). Our estimates more closely follow the approach of Atkins and Dyl (1997), who do not include an adverse information effect in their estimates of the spread. The existence of and ability to exploit informational advantages in VCTs is theorised to be relatively small. The directors of the VCT may be in a position to exploit informational advantages being better aware of the holdings of the VCT. Directors' stockholdings as disclosed in various VCT annual reports are, however, typically very small and change only very rarely. We therefore include only factors related to inventory and processing costs in the empirical model.

Atkins and Dyl (1997) model spread as:

$$SPREAD_t = \alpha + \beta_1 MVAL_t + \beta_2 VRET_t + \varepsilon_t \qquad (5)$$

where *MVAL* represents market value, *VRET* represents the variance of returns and ε is a stochastic error term. Atkins and Dyl, modelling *SPREAD* as the first stage in a two-stage estimation of holding period, and facing issues of simultaneity, also include a lagged *SPREAD* as an instrumental variable. It is inappropriate, however, to include lagged *SPREAD* in our formulation: we proceed below to add *VIR* as an independent variable, whose generating process has a significant autoregressive element; the inclusion of lagged *SPREAD* would, therefore, conflate with *VIR*, and bias the estimated coefficients. Further, Atkins and Dyl estimated their model in a cross-sectional and time series context, whereas we employ our final model to individual VCT time series.

The greater the market value of the firm, the greater the assumed depth of the market and, consequently, the lower the inventory costs (e.g., Amihud and Mendelson, 1988). Consequently the expected sign on the coefficient β_1 is negative. The higher the variance of returns the higher the risk associated with holding the stock and the greater the inventory costs. Therefore, the expected sign on coefficient β_2 is positive.

This model needs adaptation for our purposes because few VCTs are particularly large and the depth of the market is expected to change more with the performance of the VCT since inception than with the market

value of the firm. The increased flows into high performing managed funds are well documented in the literature (see, for example Sirri and Tufano (1998)). Therefore, price is taken as a proxy for willingness to buy and hence the depth of the market. The variance of the stock over the previous 30 days is included as a measure of inventory costs, after Atkins and Dyl. Where available in our data set, other measures of market depth are included in the form of the number and volume of customer bargains in the previous 30 days. This gives an estimable models as follows:

$$SPREAD_t = \alpha + \beta_1 VIR_t + \beta_2 PB_t + \beta_3 VB_t + \beta_4 BAR_t + \beta_5 VOL_t + \varepsilon_t \qquad (6)$$

where *VIR* represents the valuation effect of investment relief based upon our theoretical model; *PB* bid price; *VB* variance of the bid price over the previous 30 days (i.e., *t*-30 to *t*-1); *BAR* the number of customer bargains over the previous 30 days; and *VOL* the number of shares traded in customer bargains over the previous 30 days.

VIR is calculated from expression (1) with the following assumptions and substitutions: t'_i in respect of any fiscal year FY_i is 31st January in the fiscal year immediately following (this being the due date for personal taxation in the UK, and the rational payment date for tax payers in a net payment position); T_i is 20% or 40%, according to fiscal year, as per VCT taxation regulation; *c* over relevant periods is as obtained from HM Revenue and Customs; and discount rate $r = 4\%$ p.a. In order to assess sensitivity of results to the value adopted for *r*, our estimations are repeated using $r = 2\%$, 8% and 16% in the calculation of *VIR*.

In this model, the expected sign of the *VIR* coefficient is positive, and that of the *PB* coefficient is negative. There is no firm sign expectation concerning the coefficient of *VB*: although increasing levels of variability are generally associated with increased inventory costs and, therefore, higher spreads, they might indicate a more active market and a resulting decrease in required spread. Neither are there firm expectations concerning the coefficients of *BAR* and *VOL*: increases in these variables are normally associated with increasing depth of market and, thus, decreasing spread, but, in the particular context of this paper, the occurrence of trades might stimulate market makers to increase spread.

We allow for a difference response to 'full' *VIR* and its reduction attributable to bid price falling below initial subscription price by replacing the *VIR* variable of expression 6 with its *VIRA* and *VIRB* components, yielding a second estimable model as follows:

$$SPREAD_t = \alpha + \beta_1 VIRA_t + \beta_2 VIRB_t + \beta_3 PB_t + \beta_4 VB_t + \beta_5 BAR_t + \beta_6 VOL_t + \varepsilon_t \qquad (7)$$

where *VIRA* and *VIRB* are calculated from expression (2), with assumptions, substitutions and estimated coefficient sign expectations as above (the expected sign of both the *VIRA* and *VIRB* coefficients is positive).

As discussed above, the VCT secondary market is relatively illiquid and this is reflected in a low level of variation in the spread of a number of VCTs. In order to have sufficient variation in the dependent variable, our regression analysis excludes VCTs with less than 30 changes in the spread, reducing our sample to seventeen 'active' VCT shares.

Before estimation of the regressions, we must be satisfied as to the time series properties of the variables. Many financial time series follow a random walk (or test as such) and this may be true of our variables. To evaluate the possibility that the variables are nonstationary, Augmented Dickey-Fuller (ADF) tests were conducted for all the dependent and independent variable time series of the seventeen active VCTs.[16] The results of ADF testing may be varied by, for example, variation in the number of lags employed; but the overall picture which emerged from our testing was one of widespread inability to reject the ADF null of nonstationarity (at 5% significance or better) in the *VIRA, VIRB* and *PB* series; and rejection of the null of nonstationarity for all but one of the *VB* and *VOL* time series and the majority of *SPREAD* time series. Had the tested order of integration been consistently I(1) or higher for the all the dependent and independent variables, the common and straightforward solution would have been to estimate our models in first differences; since we are principally interested in the behaviour of the spread over the required holding period and so a short-run model is feasible. In the present case, where we have stationarity in the dependent variable, but some independent variables stationary and others nonstationary, we must employ an equally straightforward but less often used model variation: taking first differences of the nonstationary variables, whilst retaining the stationary variable in levels:

$$SPREAD_t = \alpha + \beta_1 \Delta VIR_t + \beta_2 \Delta PB_t + \beta_3 VB_t + \beta_4 BAR_t + \beta_5 VOL_t + \varepsilon_t \qquad (8)$$

$$SPREAD_t = \alpha + \beta_1 \Delta VIRA_t + \beta_2 \Delta VIRB_t + \beta_3 \Delta PB_t + \beta_4 VB_t + \beta_5 BAR_t + \beta_6 VOL_t + \varepsilon_t \qquad (9)$$

These variations in model specification do impact on interpretation of the magnitude of the estimated coefficients, but, crucially, not their expected sign.

Finally, we present and discuss plots of *SPREAD* and *VIR* variables for each of the seventeen 'active' VCTs.

5. Results

5.1 Observation and testing for a structural break

Figure 2a shows a plot of mean VCT spread against number of days to/since the end of required holding period ('relative day'); and Figure 2b shows mean VCT spread expressed as a proportion of bid price, again by relative day. Points are only plotted where data on ten or more of our VCT sample are available to

contribute to the mean for the relative day, in order that a small number of VCTs (or VCT market makers) may not dominate the profile. This leaves 3,511 plot points in each Figure, spanning the period from five years prior to end of required holding period, to a little over five years after.

***** insert Figures 2a and 2b about here *****

In both Figure 2a and Figure 2b, there is a relatively wide scatter of points in the period up to the end of required holding period, which tightens considerably after the end of the required holding period. Average VCT spread, with spread being measured in either absolute terms or as a proportion of bid price, appears to be higher prior to the end of the required holding period than after that point, albeit there is no discrete step at the end of the required holding period. Chow tests confirm a structural break in both sets of data at the end of the required holding period (in both cases at higher than the 1% level of significance).[17]

5.2 Descriptive statistics and comparisons

Panel A of Table 2 gives summary statistics upon the mean value of the *SPREAD* variable for our VCT and comparator samples.[18] The statistics are segmented between 'all periods', then 'prior to end of required holding period' and 'after end of required holding period' (the last two being pertinent only to the VCT sample). Panels B and C of Table 2 follow with descriptive statistics upon the mean value of *SPREAD* as a percentage of bid price, and mean number of customer bargains per day. Table 3 shows the results of pertinent comparison-of-mean tests.

***** insert Table 2 about here *****

The mean absolute spread for all VCTs within a five-year required holding period is 21.377 pence, with daily spread ranging between 1 and 550 pence; and for VCTs within a three-year required holding period the mean absolute spread is 17.719 pence, with spread ranging from 1 to 100 pence. By contrast, and in line with expectations under hypotheses *A* and *E*, the UK venture/development investment trust sector has a smaller mean spread of 10.888 pence over the same period. For UK growth investment trusts, the mean spread is smaller still, as is the standard deviation and range. Since there are rather more growth than venture/development investment trusts within our sample, combining the comparator samples results in statistics more closely resembling growth investment trusts. In terms of mean spread as a proportion of bid price, the difference between the two comparator samples is very small as compared to the difference between either one of them and the VCT sample; and the sense and significance of the results shown later in Table 3 (in respect of both spread and trading volume) are unaffected by taking comparisons of VCTs with either comparator sample alone instead of with the combined comparators.

We expect the spread on VCTs to be larger during the required holding period (as compared to beyond it), in line with hypotheses *C* and *E*, and this confirmed by the lower half of Table 2, Panel A where the mean spreads post required holding period for VCTs with five-year and three-year required holding periods are,

respectively, 8.129 pence and 9.608 pence; compared with 21.337 pence and 17.719 pence respectively during required holding period.

The price of our trusts are not constant over the sample period and this might naturally raise the concern that an interpretation of any differences in the absolute spreads will be misleading where market makers set spreads with regard, to some extent or other, of percentage of instrument value. Therefore, descriptive statistics upon spreads as a proportion of bid price are calculated and presented in Panel B of Table 2. Very similar conclusions may be drawn from this panel as are drawn from Panel A: we note that the spreads for VCTs are considerably larger than those for our comparator samples (consistent with hypotheses *A* and *E*); and that the spread for VCTs falls when the end of their required holding period is reached (consistent with hypotheses *C* and *E*). Our theoretical model also suggests that the VCTs with a three-year required holding period are, *ceteris paribus*, likely to have a higher spread than that in the earlier years of the required holding period of those VCTs with a five-year required holding period. This, hypothesis *F*, is supported by a mean proportion spread in for VCTs in the first three years of a five year required holding period being 0.01 lower than that for VCTs with a three-year required holding period (significant at better than 1%; Table 3, Panel B, line 3).

A further topic of interest is whether the volume of trading is relatively small for VCTs within their holding period as compared with after and in comparison to more conventional instruments. Customer bargains per day are chosen as the basis for analysis since we are interested in the influence of tax effects on individuals' decisions (and including market maker bargains would not provide a basis on which to compare the effects of changing tax liability on private shareholders). Table 2, Panel C is in line with expectations and hypothesis *B* and *D*: VCTs are very thinly traded during their required holding period, in comparison to VCTs beyond their required holding period and, most markedly, in comparison to our comparator investment trusts. Albeit the data upon comparator samples in this respect is not fully controlled (for, e.g., number of units in issue or value), the results are, we submit, stark and compelling.

Table 3 presents the results of formal tests of the difference between the means as discussed above. All differences, supporting hypotheses *A* to *F* inclusive, are significant at the 1% level. A commentary upon some of the key comparisons follows.

***** insert Table 3 about here *****

The first and second rows of Table 3, Panel A present tests of whether the spread for VCTs falls when their five-year or three-year required holding period ends. The differences of 13.247 pence and 8.111 pence are both of the expected sign and statistically significant at a 1% level. Following the discussion of the statistics in Table 2, comparison of VCTs and our other sampled trusts is more appropriate if undertaken for proportion as opposed to absolute spreads. Table 3, Panel B therefore presents a comparison of the mean proportion spreads. We see in the first and second and rows of Table 3, Panel B that proportion spread for VCTs falls when their five-year or three-year required holding period ends (in confirmation of the findings

from Panel A, again significant at the 1% level in each case). In the third row of Panel B, we see that the VCTs within a three-year required holding period have a significantly higher mean proportion spread than those with a five-year required holding period.

Since the proportion spreads on our two comparator samples are only marginally different (see Table 2, Panel B), we select the combined comparator sample as a basis for comparison with VCT percentage spreads in Table 3, Panel B. In each comparison, the percentage spread on VCTs is significantly greater than that of the comparators. This finding in isolation may indicate merely that the spread on VCTs is greater than that on more conventional investment trusts because the market is thinner, irrespective of whether the required holding period has ended (and, therefore, market makers require a greater spread to cover higher inventory costs). This possibility is controlled for in our regression analysis and addressed directly in hypotheses *C* and *F*.

Panel C of Table 3 provides results of comparisons of number VCT customer bargains per day before versus after the end of their required holding periods; and between VCTs and comparators. Although the mean number of VCT customer bargains is relatively small both before and after the end of their required holding periods, the number per day after the end of the required holding periods is about three to ten (depending on the VCT subsample chosen) times the number observed before the end of the required holding periods (difference statistically significant at the 1% level). Trading in VCTs is markedly thinner than in the comparator samples, significant at the 1% level, albeit this result is subject to foregoing caveats.

5.3 Regression estimations

An earlier section discusses model development. The empirical models (8) and (9) were estimated for the period from supposed cash benefit of investment relief until end of required holding period (that is, for $t'_0 < t < t_0+NY$, the 'middle section' of model (1)) for each of the 'active' VCTs in our sample by the method ordinary least squares. The estimation results are summarised in Tables 4 and 5. In each estimated model, the coefficients of the regression are jointly significant per the *F* statistic.

***** insert Tables 4 and 5 about here *****

As regards the independent variables in the models designed to control for standard bid-ask spread, the estimated coefficient of ΔPB is negative in 24 of 34 cases (significant at generally acceptable levels of significance in fourteen of these cases); and the estimated coefficient of *VB* is also positive in 24 of 34 cases (significant in twenty of these cases). These results are consistent with, respectively, the 'depth of market' and 'increased inventory costs' hypotheses set out in section 4.3 above.

In respect of our focal variables, however, the results are mixed. The estimated coefficient of ΔVIR (model 8) is positive in eight of seventeen cases (and significant in only two of these cases) and negative in eight cases (significant in two). Slightly stronger results to support hypothesis *E* come from estimation of

model (9), where the estimated coefficient of *ΔVIRA* is positive in fourteen of seventeen cases (significant in three cases), and negative in only three cases (none significant); and the estimated coefficient of *ΔVIRB* is positive in eight of seventeen cases (significant in only one) and negative in nine cases (significant in two).[19]

A common feature of all the estimated models, however, is very low Durbin-Watson statistic – supporting rejection of the null hypothesis of no first order serial correlation in the error terms of the estimated models in favour of positive first order serial correlation. Given the nature of the dependant variable series as discussed in section 5.4 (below) this is unsurprising – indeed, supports the 'stickiness' finding from inspection of the *SPREAD* data (below). A consequence of this serial correlation in errors, however, is that the standard errors in the estimated models are likely to be suppressed, which would increase the *t* statistics and mean, in turn, that any significance claimed is generous. It is essential, therefore, to re-estimate the models using a procedure designed to control for any autocorrelation in the errors. The Hildreth-Lu procedure is appropriate for this task.[20] The results from re-estimation under Hildreth-Lu are presented in Tables 6 and 7. The Hildreth-Lu procedure allows for an autoregressive structure in the regression errors. As expected, the regressions estimated under Hildreth-Lu show significantly increased R^2 statistics, Durbin-Watson statistics more closely grouped around 2, and estimated error autoregressive adjustment parameters (column '*Rho*' in the Tables) is positive and significant in all cases.

Results in respect of our focal variables remain mixed: The estimated coefficient of *ΔVIR* (model 8, estimated using Hildreth-Lu) is positive in five of seventeen cases (significant in three of these cases) and negative in twelve cases (significant in nine). Similar results come from estimation model (9) using Hildreth-Lu, where the estimated coefficient of *ΔVIRA* is positive in six of seventeen cases (although not significant in any case); and the estimated coefficient of *ΔVIRB* is positive in six of seventeen cases (significant three cases). Regarding the estimated coefficients of *ΔPB* and *VB*, conclusions concerning the 'depth of market' and 'increased inventory costs' hypotheses are maintained.

***** insert Tables 6 and 7 about here *****

In order to assess sensitivity of results to the value adopted for *r* in our calculations of *VIR* from expression (1), our estimations are repeated with *VIR* calculated using, in turn, *r* = 2%, 8% and 16% (the foregoing being based on *VIR* calculated with *r*=4%p.a.). Results are essentially as reported above.[21]

The mixed findings from regression analyses warrant further investigation. The next section presents and discusses plots of the data for these cases.

5.4 Inspection and discussion of plots of SPREAD and VIR

Figures 3.1 to 3.3 show three archetype plots of *SPREAD* and *VIR*, chosen to represent the plots of all seventeen 'active' VCT shares. The figures plot data from the point of investment relief cash flow benefit to the end of the required holding period (i.e., as used in the regression analysis). Eight of our seventeen active

VCTs give plots of the type in Figure 3.1; three of them give plots of the type in Figure 3.2; and six of them of the type in Figure 3.3. The plots for all seventeen VCTs are not reproduced in the interests of economy, but are available from the authors. Across the figures for all seventeen active VCTs, it is apparent that there is a certain 'stickiness' of variable *SPREAD* – to be a whole number of pence, commonly at either 5p or 10p, and often maintained at the same value for some considerable number of days. This explains readily the strong positive serial correlation seen in the errors of the regressions estimated by basic OLS (and evidenced in the low Durbin-Watson statistics): the dependent variable commonly stays constant for some period, during which the regression estimate of that variable rarely crosses the true value.

***** insert Figure 3 (3.1, 3.2 and 3.3) about here *****

Another feature of the figures is that *SPREAD*, although very high by conventional standards (James, 2000 suggests a spread of 0.75% of market price within an overall upper bound of 1.80% on trading costs), is commonly lower than the value of *VIR* predicted by out theoretical model, as for the plots of eight VCTs of the type shown in Figure 3.1. In the plots for the three VCTs of the type shown in Figure 3.2, we see *SPREAD* lower than *VIR* for the most part of the required holding period, but jumping up to more closely track *VIR* towards the end of the required holding period. For the six VCTs whose plots are typified by Figure 3.3, we see *SPREAD* tracking *VIR* more closely throughout the required holding period, with *SPREAD* above *VIR* for some considerable periods. This last group is perhaps suggestive that some moving average in *SPREAD* follows *VIR*; but any such moving average could not be applicable to the other groups. What is clear is that there are a variety behaviours of *SPREAD* in relation to *VIR*; but that *SPREAD* is ever maintained at well above conventional levels.

It is also apparent that 10p was a de facto upper limit on *SPREAD* over substantial periods for a number of the VCTs. Representing some 8% to 20% of the market value of shares commonly priced in the 50p – 120p range, perhaps market makers simply could not conceive of the need for *SPREAD* above 10p. Indeed, our argument for the inclusion of *VIR* within *SPREAD* (section 2 above) led, inter alia, to a hypotheses of low trading volume for VCT share within required holding period (hypothesis *B*). This hypothesis is supported by our findings (section 5.2 above). The setting of *SPREAD* at an abnormally high level (as also confirmed by our section 5.2 findings), perhaps not incorporating the level of *VIR* exactly but informed by it, would effectively shut down the trading of VCT shares, forestalling any trades other than those made in extremis (by, for example, distressed sellers) – and protecting VCT market makers from the value loss which would be likely if *SPREAD* were set at more conventional levels.

Drawing back from our sample of 17 active VCTs, and returning to our full sample of 108 VCTs (with an aggregate of 57,242 daily observations within required holding period), Figure 4 presents a histogram of deviations of *SPREAD* from *VIR*. The deviation of *SPREAD* from *VIR* is seen to cluster around zero; and approximately half of the observations of *SPREAD* are within 10p of *VIR*. There is a substantial tail to the right, in which some extraordinarily high values of *SPREAD* are seen – which, we submit, can only be the result of over-enthusiastic action to shut down trading by market makers.

***** insert Figure 4 about here *****

Overall in sections 5.3 and 5.4, we find that *SPREAD* , way above conventional levels, is informed by *VIR*; and that VCT spread responds to factors such as price and volatility in a similar fashion to other instruments. These findings complement those set out in sections 5.1 and 5.2 to confirm that tax effects are priced into the spread and that price and trading behaviour in the VCT market conforms substantially to theory and associated expectations.

6. Conclusion

This paper documents theoretical and empirical evidence of a lock-in effect arising from the conditional nature of tax incentives provided to increase demand for Venture Capital Trust IPOs. In particular, VCT bid-ask spreads evolve over time in a way that is consistent with investment relief being valued in the share price by the shareholder during the required holding period, after the end of which the spread falls significantly; and/or with market makers setting spread to effectively shut down trading in VCT shares within the required holding period. Evidence of tax effects exists where the spread is greater for VCTs than it is for comparators in respect of which conditional tax incentives do not exist; and where spreads are greater for VCTs with a three-year as opposed to a five-year required holding period. In essence, the non-transferability of investment relief from initial subscribers to secondary purchasers results in a significant divergence of these respective parties' valuations. Consistent with the influence of the required holding period on investor behaviour, the number of customer bargains is minimal during this period and increases significantly thereafter. Although there are potential non-tax explanations, there is evidence that VCT trading volume less than that for comparable non-VCT investment vehicles. Circumstantial evidence in the form of buy backs is also consistent with the presence of a lock-in effect.

This study is novel in that the magnitude of the lock-in effect can be calculated with certainty without requiring access to confidential shareholder information. In addition, a further methodological opportunity is provided by an unexpected change in related taxation legislation (as regards length of required holding period).

Our results lead to a questioning of the benefit of requiring VCTs to be listed companies. This is reinforced by the relatively low importance attached to exit strategy concerns by VCT shareholders at the time of subscribing. A listing may bring benefits such as increased monitoring, suggesting reduced agency costs between managers and shareholders; but, conversely, agency costs may be increased because it is so expensive for shareholders, in the event of displeasure with directors' actions, to dispose of their VCT holding with the required holding period. An interesting question is whether the purported benefits of a full market listing exceed the direct and indirect costs associated with obtaining and maintaining that listing.

[1] In order to comply with European Commission regulation of state aid this requirement will be relaxed to require listing on any 'European Union Regulated Market' (HM Treasury, 2009a). The necessary legislation will be included in the Finance Bill 2010.

[2] In general, financial institutions and non UK income tax payers dominate the ownership of UK quoted companies. As at 31 December 2001 UK tax-exempt pension funds held 16% of the market value of the London Stock Exchange and UK insurance companies whose business also includes tax-exempt pension funds held a further 20%. The largest shareholding group was non-UK institutions and individuals, which held 36% (Office of National Statistics, 2002). At 31 December 2006 a similar position held, the respective percentages were 13%, 15% and 40% (Office of National Statistics, 2007).

[3] After allowing a three-year period in which to identify and appraise potential investments, at least 70% of the VCT's investments must comprise new issues in unquoted trading companies. Of this 70%, at least 30% must be in the form of equity, and the balance may be preference or debt capital.

[4] In an attempt to ensure a diversified portfolio, no single holding may exceed 15% of the VCT's investments.

[5] In order to target investment at small, unquoted funds, there is an upper limit on the size of companies in which VCTs may invest. Immediately prior to investment by the VCT, the gross assets of the investment target company must not exceed £15m; and immediately after, they may not exceed £16m (prior to 6th April 1998 the corresponding figures were £10m and £11m).

6 Discussions with VCT managers indicate, however, that VCT investors rarely consider exit strategy options at the time of initial subscription. This view is consistent with the findings reported in PACEC (2003).

[7] Liquidity could also be provided under general powers available to all limited companies (S.163, Companies Act 1985) to make market purchases or buy-backs of their own shares. All of the seventeen VCTs focused upon in section 5.3 and Tables 4 and 5 (see subsequent discussion) have adopted such powers. The terms of the permitted buy-backs, based on a review of the buy-back terms of ten of the eighteen VCTs, indicates that the maximum price permitted is based on 105% of mid-market price (6 VCTS) or the lower of 105% of the mid-market price and net asset value (4 VCTs). Clearly, under both mechanisms of price determination, the conditional form of the investment relief will still create a lock-in effect, although taking a mid-market price reduces its magnitude.

[8] In his budget speech, the Chancellor of the Exchequer announced on 17th March 2004 a series of changes to the nature of the tax incentives. For shares issued on or after 6 April 2004 the rate of income tax relief for investments was to be increased from 20% to 40%; capital gains tax deferral relief was no longer available for gains reinvested in VCT; and the annual taxpayer VCT investment limits was raised from £100,000 to £200,000. These changes recognised the primacy of income tax related reliefs over gain deferral or roll over relief.

[9] Subject originally to an upper investment limit of £100,000 per fiscal year per individual, later raised (see previous footnote).

[10] We assume rationality in the repayment of overdue tax, that is, given the usual level of clawback interest rate in comparison to expected risk adjusted asset returns, that overdue tax will be paid immediately a liability is recognised.

[11] As might be expected, later analysis shows a significant correlation between *VIR* and bid price, which is used as a control variable in the multivariate regression analysis which follows. The use of *VIR* decomposed into variables *VIRA* and *VIRB* partially overcomes the potential multicollinearity present when using a single *VIR* variable. See endnote 18 for further details.

[12] These 137 are represented in Table 1 as 125 new issues, 1997-98 onwards, plus 12 of the 14 issues in 1995-1996 and 1996-1997 where no split between new issues and further issues is reported.

[13] It was necessary to complete the collection of the required data set by purchasing the volume data directly from the London Stock Exchange because of Datastream's decision not to collect data on number of customer bargains and number of shares traded therein from 27th March 2002.

[14] The exclusion of *PB* between zero and one pence entailed the removal of relatively few observations, but avoided extreme values arising when *SPREAD* was considered as a proportion of *PB* (see later section). Comparability with the VCT sample is not compromised, however, since the smallest *PB* observation in the VCT sample was four pence.

[15] Since the London Stock Exchange was unable to provide data on daily trading prior to 1st October 1997, the final samples included (respectively) only 145,124, 24,517 and 44,388 daily observations for number of customer bargains and number of shares traded in customer bargains.

[16] See Enders (1995) or Greene (2000) for a discussion of the ADF test and appropriate responses where series test as nonstationary.

[17] The spread declines just before the end of the holding period The implication is that the required holding period ended in fact, on average, just prior to the date which we calculated. A possible reason is our calculations were necessarily based on the listing date of the VCT shares; yet required holding properly runs from subscription date, which often preceded the listing date. We thank a reviewer for drawing our attention to this observation.

[18] All but two of the VCTs in our sample were issued at a price of 100p per share. One VCT was issued at a price of 98p per share; and another at 20p per share.

[19] The mean correlation coefficient between the variables ΔVIR and ΔPB is 0.751 for the sample of 17 active VCTs. When the decomposed variables are used, the mean correlation coefficient between $\Delta VIRA$ and ΔPB is -0.026; and that between $\Delta VIRB$ and ΔPB is 0.752. A number of individual coefficients, however, are in excess of 0.9. Therefore, there is a strong possibility that the reported results are affected by multicollinearity with respect to the variables ΔVIR and

ΔPB in the first model and *ΔVIRB* and *ΔPB* and in the second model. None of the correlation coefficients amongst the other control variables are 'high' (the highest value being 0.552, as between *VOL* and *BAR*).

[20] In preference, for example, to the Cochrane-Orcutt procedure, which, unlike Hildreth-Lu, is susceptible to finding local rather than global optima.

[21] The only noteworthy deviations are in OLS estimation of model (9), where, when r=8% or 16% is adopted, the number of estimated *ΔVIRA* coefficients are reduced to eight or seven (respectively) out of seventeen, of which seven are significant; i.e., reduced incidence of positive estimates of the *ΔVIRA* coefficient, but increased incidence of significant positive estimates.

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Table 1
VCT issues in fiscal years 1995/96 to 2008/09

Fiscal year	*New issues*		*Further issues*		*Total*	
	Number	*Proceeds (£m)*	*Number*	*Proceeds (£m)*	*Number*	*Proceeds (£m)*
VCTs with five-year required holding period						
1995-1996		split not reported			10	138.6
1996-1997		split not reported			4	30.2
1997-1998	4	33.6	10	7.3	14	40.9
1998-1999	7	83.2	66	75.3	73	158.6
1999-2000	8	77.1	91	147.3	99	224.4
VCTs with three-year required holding period						
2000-2001	17	193.4	112	189.5	129	382.9
2001-2002	13	66.4	200	156.5	213	222.8
2002-2003	2	7.5	179	181.6	181	189.0
2003-2004	0	0.0	181	61.5	181	61.5
2004-2005	21	80.6	244	295.6	265	376.2
2005-2006	24	116.0	369	618.3	393	734.3
2006-2007	11	90.7	155	299.8	166	390.5
2007-2008	10	53.6	130	141.3	140	194.9
2008-2009	8	40.7	162	139.3	170	180.0
Total	125	842.8	1,899	2,313.4	2,038	3,325.0

Sources:
Primary Market Fact Sheet, various months, London Stock Exchange (re: 1995/96 and 1996/97)
New Issues and IPOs Summary, London Stock Exchange (re: 1997/98 onwards)
Further Issues Summary, London Stock Exchange (re: 1997/98 onwards)

Figure 1
Profile of valuation of investment relief over time

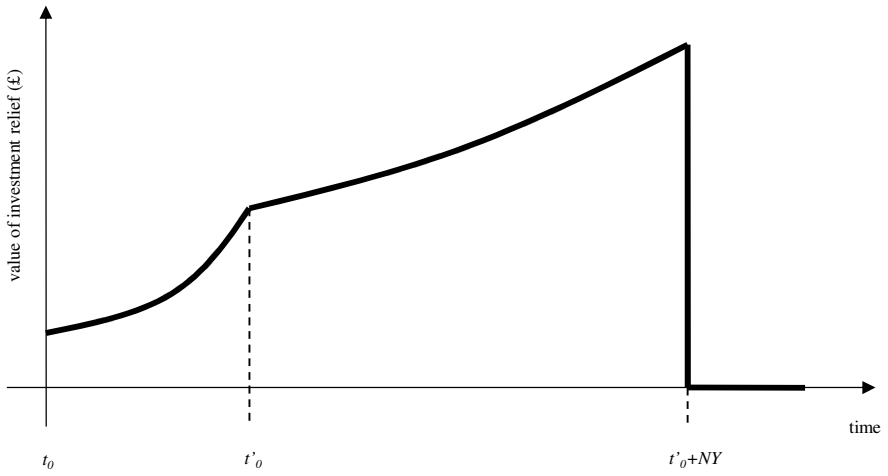
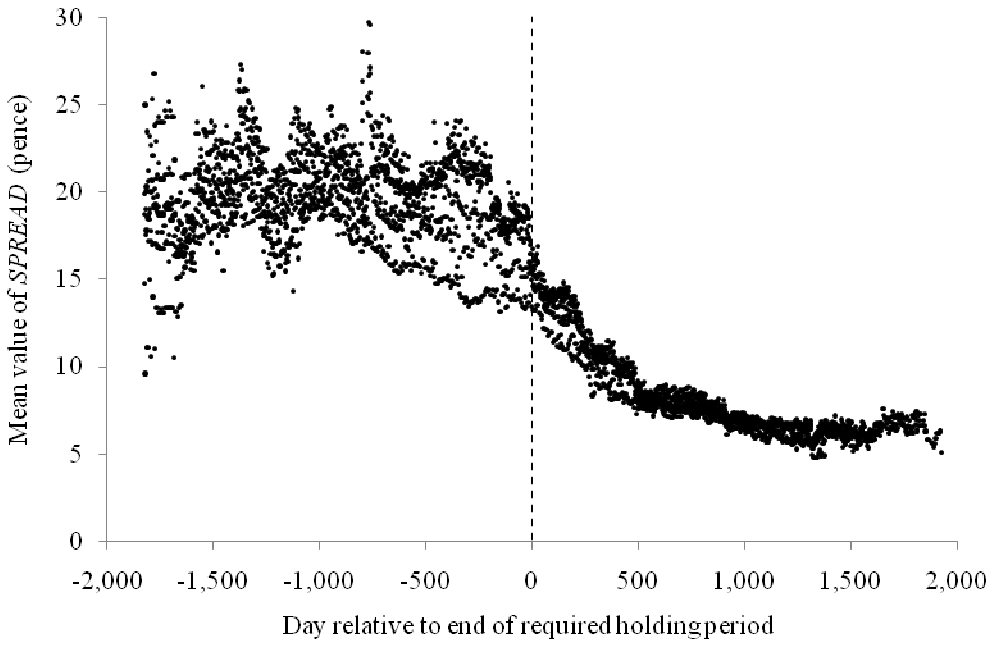
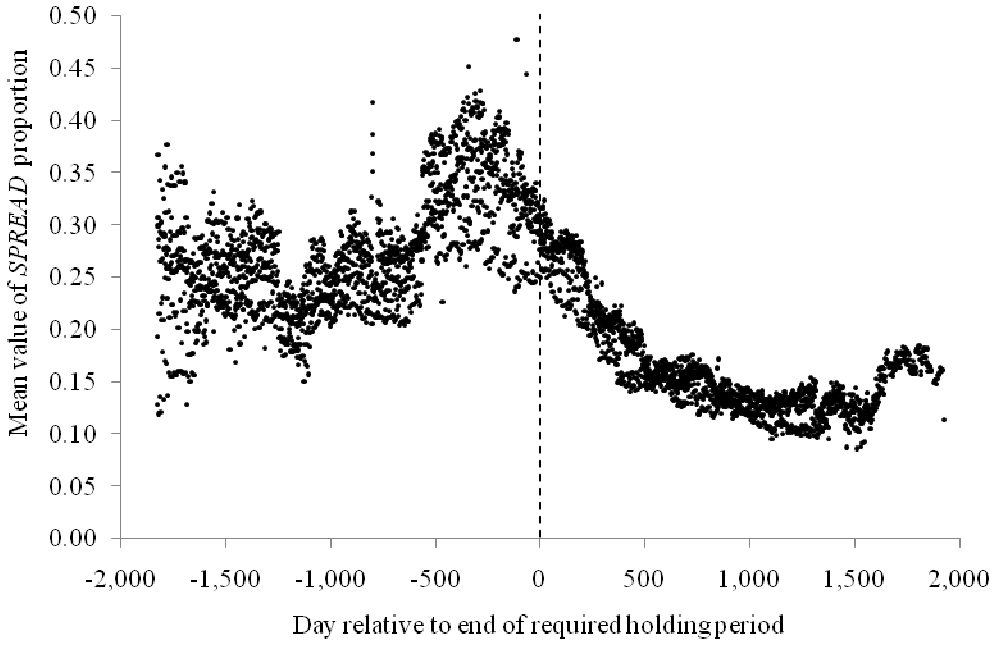


Figure 2a
Mean value of SPREAD against day to/since end of RHP



Chow test for structural break at end of RHP:
$F(2, 3507) = 1{,}630.9$ (significant at better than 1%)

Figure 2b
Mean value of *SPREAD* as proportion of bid against day to/since end of RHP



Chow test for structural break at end of RHP:
$F(2, 3507) = 2{,}136.7$ (significant at better than 1%)

Table 2
Descriptive statistics

	Mean	*SD*	*Min*	*Max*	*n*
Panel A: SPREAD in pence					
All periods					
VCTs with a five-year required holding period	15.409	22.367	0.25	550.00	77,849
VCTs with a three-year required holding period	14.773	10.653	0.25	100.00	70,779
All VCTs	15.106	17.781	0.25	550.00	148,628
Comparator sample: UK venture/development	10.888	15.817	0.50	100.00	26,442
Comparator sample: UK growth	6.976	12.260	0.25	90.00	48,489
All comparators	8.356	13.749	0.25	100.00	74,931
Prior to end of required holding period					
VCTs with a five-year required holding period	21.377	28.270	1.00	550.00	42,781
VCTs with a three-year required holding period	17.719	11.089	1.00	100.00	45,069
All VCTs	19.500	21.345	1.00	550.00	87,850
After end of required holding period					
VCTs with a five-year required holding period	8.129	6.257	0.25	50.00	35,068
VCTs with a three-year required holding period	9.608	7.415	0.25	40.00	25,710
All VCTs	8.755	6.810	0.25	50.00	60,778
Panel B: SPREAD as a proportion of bid price					
All periods					
VCTs with a five-year required holding period	0.240	0.344	0.0067	9.00	77,849
VCTs with a three-year required holding period	0.235	0.316	0.0030	6.00	70,779
All VCTs	0.238	0.331	0.0030	9.00	148,628
Comparator sample: UK venture/development	0.056	0.101	0.0004	1.19	26,442
Comparator sample: UK growth	0.042	0.132	0.0006	6.00	48,489
All comparators	0.047	0.122	0.0004	6.00	74,931
Prior to end of required holding period					
VCTs with a five-year required holding period	0.302	0.435	0.0106	9.00	42,781
VCTs with a three-year required holding period	0.264	0.361	0.0101	6.00	45,069
All VCTs	0.283	0.399	0.0101	9.00	87,850
After end of required holding period					
VCTs with a five-year required holding period	0.165	0.149	0.0067	2.50	35,068
VCTs with a three-year required holding period	0.184	0.206	0.0030	1.20	25,710
All VCTs	0.173	0.176	0.0030	2.50	60,778
Panel C: Customer bargains per day					
All periods					
VCTs with a five-year required holding period	0.218	0.821	0	74	74,345
VCTs with a three-year required holding period	0.145	0.584	0	40	70,779
All VCTs	0.183	0.716	0	74	145,124
Comparator sample: UK venture/development	2.888	4.276	0	79	24,517
Comparator sample: UK growth	6.477	9.378	0	206	44,388
All comparators	5.200	8.131	0	206	68,905
Prior to end of required holding period					
VCTs with a five-year required holding period	0.110	0.807	0	74	39,277
VCTs with a three-year required holding period	0.030	0.207	0	6	45,069
All VCTs	0.067	0.573	0	74	84,346
After end of required holding period					
VCTs with a five-year required holding period	0.340	0.820	0	31	35,068
VCTs with a three-year required holding period	0.349	0.894	0	40	25,710
All VCTs	0.343	0.852	0	40	60,778

Table 3
Comparison of means

	Difference in mean	*Hypothesised sign*	*Associated hypotheses*	*t statistic*	*Sig.*
Panel A: Mean value of SPREAD in pence					
VCTs with 5 yr RHP: within RHP versus beyond RHP	13.247	+ve	C, E	94.15	*
VCTs with 3 yr RHP: within RHP versus beyond RHP	8.111	+ve	C, E	116.26	*
Panel B: Mean value of SPREAD as a proportion of bid price					
VCTs with 5 yr RHP: within RHP versus beyond RHP	0.137	+ve	C, E	61.16	*
VCTs with 3 yr RHP: within RHP versus beyond RHP	0.080	+ve	C, E	37.59	*
VCTs within RHP: with 5 yr RHP[a] vs. with 3 yr RHP	-0.010	-ve	F	-3.52	*
VCTs within 5 yr RHP versus comparators	0.255	+ve	A, C, E	118.59	*
VCTs within 3 yr RHP versus comparators	0.217	+ve	A, C, E	123.62	*
All VCTs within RHP versus comparators	0.235	+ve	A, C, E	166.09	*
VCTs beyond 5 yr RHP versus comparators	0.117	n/a	n/a	129.08	*
VCTs beyond 3 yr RHP versus comparators	0.137	n/a	n/a	100.51	*
All VCTs beyond RHP versus comparators	0.126	n/a	n/a	149.57	*
Panel C: Mean number of customer bargains per day					
VCTs with 5 yr RHP: beyond RHP versus within RHP	0.230	+ve	D	38.37	*
VCTs with 3 yr RHP: beyond RHP versus within RHP	0.319	+ve	D	56.39	*
VCTs within 5 yr RHP versus comparators	-5.090	-ve	B	-162.91	*
VCTs within 3 yr RHP versus comparators	-5.170	-ve	B	-166.83	*
All VCTs within RHP versus comparators	-5.133	-ve	B	-165.37	*
VCTs beyond 5 yr RHP versus comparators	-4.860	n/a	n/a	-155.35	*
VCTs beyond 3 yr RHP versus comparators	-4.851	n/a	n/a	-154.14	*
All VCTs beyond RHP versus comparators	-4.856	n/a	n/a	-155.81	*

The difference in mean of *'x versus y'* is calculated as *x-y*.

* indicates significance at the 1% level or better

[a] considering observations in the first three years of the RHP, for consistency with VCTs with a three year RHP

Table 4

Estimation of $SPREAD = \alpha + \beta_1 \Delta VIR + \beta_2 \Delta PB + \beta_3 VB + \beta_4 BAR + \beta_5 VOL + \varepsilon$ using OLS for 17 active VCTs

No.	*Const.*	*ΔVIR*	*ΔPB*	*VB*	*BAR*	*VOL*	*Adj. R^2*	*n*	*F*	*DW*
1	6.3274	-4.2373	0.7812	0.3097	-0.4469	0.0000	0.29	724	F(5,718)	0.05
	(22.34***)	(-0.40)	(0.30)	(16.77***)	(-5.95***)	(2.97***)			(59.93***)	
2	11.1054	0.8389	-0.2147	0.0036	0.2659	0.0000	0.08	757	F(5,751)	0.03
	(31.25***)	(0.46)	(-1.96**)	(1.04)	(3.32***)	(0.46)			(13.73***)	
3	7.9409	1.5519	-0.4632	-0.0002	0.0256	0.0000	0.16	856	F(5,850)	0.15
	(60.39***)	(0.48)	(-0.63)	(-0.04)	(0.94)	(-11.18***)			(34.16***)	
4	8.0965	1.8008	-0.6607	-0.0164	-0.0742	0.0000	0.08	856	F(5,850)	0.20
	(73.26***)	(0.49)	(-0.74)	(-1.02)	(-2.76***)	(-2.29**)			(16.07***)	
5	7.6556	-4.4562	0.7921	-0.0686	0.0558	0.0000	0.02	856	F(5,850)	0.05
	(58.96***)	(-0.69)	(0.55)	(-2.03**)	(1.89*)	(-3.33***)			(3.74***)	
6	15.8393	0.8610	-0.6487	0.3463	-0.6940	0.0000	0.48	856	F(5,850)	0.06
	(34.25***)	(0.13)	(-0.45)	(26.89***)	(-8.17***)	(-1.25)			(157.77***)	
7	10.5641	7.9912	-2.1481	0.1915	0.2677	-0.0001	0.21	852	F(5,846)	0.08
	(35.58***)	(1.41*)	(-1.55*)	(11.60***)	(3.89***)	(-9.24***)			(47.21***)	
8	21.4314	5.1395	-1.8848	0.2168	5.1649	-0.0002	0.36	856	F(5,850)	0.03
	(29.33***)	(1.15)	(-2.25**)	(16.59***)	(10.61***)	(-4.77***)			(95.76***)	
9	7.8545	-1.2083	-0.0160	0.0021	-0.0494	0.0000	0.03	855	F(5,849)	0.26
	(58.47***)	(-1.95**)	(-0.43)	(3.40***)	(-3.22***)	(-2.32**)			(6.17***)	
10	7.2440	-1.6771	0.0078	0.1981	-0.0855	0.0000	0.11	1,051	F(5,1045)	0.08
	(68.28***)	(-0.46)	(0.01)	(10.98***)	(-1.69*)	(-2.84***)			(26.98***)	
11	6.3559	-3.1116	0.2012	-0.0095	0.0115	0.0000	0.01	802	F(5,796)	0.07
	(34.35***)	(-0.60)	(0.18)	(-0.31)	(0.35)	(0.33)			(2.78**)	
12	13.9393	-0.3193	0.1337	0.0013	0.1350	-0.0001	0.62	958	F(5,952)	0.33
	(28.10***)	(-0.30)	(5.04***)	(5.57***)	(7.43***)	(-7.37***)			(307.52***)	
13	10.3084	-1.5934	0.0002	0.0481	0.4040	0.0000	0.08	1,039	F(5,1033)	0.09
	(42.77***)	(-0.32)	(0.00)	(5.52***)	(5.27***)	(-4.34***)			(20.15***)	
14	9.2912	-2.9236	-0.0076	0.0001	-0.0976	0.0000	0.06	1,040	F(5,1034)	0.09
	(62.12***)	(-3.63***)	(-0.18)	(0.09)	(-4.54***)	(2.49**)			(14.33***)	
15	10.4576	0.3762	-0.1683	-0.0003	0.8075	0.0000	0.51	963	F(5,957)	0.20
	(67.64***)	(0.55)	(-2.70***)	(-0.20)	(27.39***)	(-5.29***)			(200.65***)	
16	13.1326	-0.9150	-0.1911	0.0595	2.7257	-0.0001	0.76	974	F(5,968)	0.16
	(30.34***)	(-0.51)	(-1.54*)	(21.06***)	(31.08***)	(-16.93***)			(630.97***)	
17	4.4066	17.1149	-3.7912	0.0478	-0.1474	0.0000	0.08	1,052	F(5,1046)	0.12
	(43.00***)	(3.64***)	(-4.08***)	(5.16***)	(-2.77***)	(-1.17)			(19.26***)	

* denotes significance at the 10% level; ** at 5%; and *** at 1%.

Table 5

Estimation of $SPREAD = \alpha + \beta_1 \Delta VIRA + \beta_2 \Delta VIRB + \beta_3 \Delta PB + \beta_4 VB + \beta_5 BAR + \beta_6 VOL + \varepsilon$ using OLS for 17 active VCTs

No.	*Const.*	*ΔVIRA*	*ΔVIRB*	*ΔPB*	*VB*	*BAR*	*VOL*	*Adj. R^2*	*n*	*F*	*DW*
1	6.1692	11.6795	-7.0990	1.4797	0.3091	-0.4477	0.0000	0.29	724	F(6,717)	0.05
	(16.83***)	(0.45)	(-0.62)	(0.53)	(16.72***)	(-5.96***)	(2.98***)			(49.98***)	
2	10.5219	60.1702	0.8951	-0.2212	0.0036	0.2638	0.0000	0.08	757	F(6,750)	0.04
	(19.16***)	(1.41*)	(0.49)	(-2.02**)	(1.04)	(3.29***)	(0.49)			(11.78***)	
3	7.8978	5.7433	1.2570	-0.3961	-0.0003	0.0260	0.0000	0.16	856	F(6,849)	0.15
	(45.93***)	(0.51)	(0.38)	(-0.52)	(-0.06)	(0.95)	(-11.18***)			(28.46***)	
4	8.1087	0.5540	1.9385	-0.6943	-0.0164	-0.0742	0.0000	0.08	856	F(6,849)	0.20
	(53.95***)	(0.05)	(0.50)	(-0.74)	(-1.02)	(-2.76***)	(-2.29**)			(13.38***)	
5	7.5483	6.1223	-6.3963	1.2318	-0.0682	0.0545	0.0000	0.02	856	F(6,849)	0.05
	(40.53***)	(0.42)	(-0.92)	(0.80)	(-2.01**)	(1.84*)	(-3.30***)			(3.22***)	
6	15.7780	7.1523	0.7538	-0.6237	0.3463	-0.6945	0.0000	0.48	856	F(6,849)	0.06
	(24.80***)	(0.16)	(0.12)	(-0.43)	(26.87***)	(-8.16***)	(-1.24)			(131.32***)	
7	10.2945	35.5351	6.4709	-1.7736	0.1904	0.2674	-0.0001	0.21	852	F(6,845)	0.09
	(27.89***)	(1.54*)	(1.12)	(-1.25)	(11.52***)	(3.89***)	(-9.24***)			(39.62***)	
8	19.6848	181.8245	5.1390	-1.8714	0.2168	5.1632	-0.0002	0.36	856	F(6,849)	0.04
	(15.74***)	(1.77**)	(1.15)	(-2.23**)	(16.61***)	(10.61***)	(-4.79***)			(80.47***)	
9	7.7873	5.8191	-1.2210	-0.0152	0.0021	-0.0498	0.0000	0.03	855	F(6,848)	0.27
	(41.41***)	(0.42)	(-1.97**)	(-0.41)	(3.42***)	(-3.24***)	(-2.32**)			(5.18***)	
10	7.3385	-11.9774	-0.9750	-0.1608	0.1978	-0.0836	0.0000	0.11	1,051	F(6,1044)	0.08
	(46.79***)	(-0.91)	(-0.26)	(-0.18)	(10.97***)	(-1.66*)	(-2.83***)			(22.59***)	
11	6.1273	21.9077	-5.3728	0.6999	-0.0091	0.0089	0.0000	0.01	802	F(6,795)	0.08
	(25.38***)	(1.23)	(-1.00)	(0.60)	(-0.29)	(0.27)	(0.37)			(2.69**)	
12	14.3363	-45.5775	-0.3102	0.1329	0.0013	0.1351	-0.0001	0.62	958	F(6,951)	0.33
	(19.09***)	(-0.71)	(-0.29)	(5.01***)	(5.55***)	(7.43***)	(-7.36***)			(256.21***)	
13	10.5044	-24.0903	-0.9618	-0.1365	0.0482	0.4045	0.0000	0.08	1,039	F(6,1032)	0.09
	(29.96***)	(-0.81)	(-0.19)	(-0.13)	(5.54***)	(5.28***)	(-4.33***)			(16.88***)	
14	9.1997	7.8173	-2.9420	-0.0064	0.0001	-0.0980	0.0000	0.06	1,040	F(6,1033)	0.10
	(40.85***)	(0.40)	(-3.65***)	(-0.15)	(0.10)	(-4.56***)	(2.48**)			(11.98***)	
15	10.2665	22.6125	0.3395	-0.1630	-0.0003	0.8073	0.0000	0.51	963	F(6,956)	0.20
	(39.48***)	(0.93)	(0.49)	(-2.60***)	(-0.20)	(27.38***)	(-5.28***)			(167.32***)	
16	13.1210	0.4509	-0.9159	-0.1913	0.0595	2.7257	-0.0001	0.76	974	F(6,967)	0.16
	(20.35***)	(0.01)	(-0.51)	(-1.54*)	(21.04***)	(31.06***)	(-16.91***)			(525.27***)	
17	4.5129	3.9420	18.2484	-4.0130	0.0477	-0.1450	0.0000	0.08	1,052	F(6,1045)	0.13
	(31.73***)	(0.30)	(3.78***)	(-4.22***)	(5.15***)	(-2.73***)	(-1.16)			(16.25***)	

* denotes significance at the 10% level; ** at 5%; and *** at 1%.

Table 6

Estimation of $SPREAD = \alpha + \beta_1 \Delta VIR + \beta_2 \Delta PB + \beta_3 VB + \beta_4 BAR + \beta_5 VOL + \varepsilon$ using Hildreth-Lu for 17 active VCTs

No.	*Const.*	*ΔVIR*	*ΔPB*	*VB*	*BAR*	*VOL*	*Rho*	*Adj. R^2*	*n*	*F*	*DW*
1	7.6385	0.3329	-0.4386	0.0809	-0.0199	0.0000	0.9882	0.97	723	F(6,716)	1.96
	(2.68***)	(0.21)	(-1.14)	(1.95*)	(-0.26)	(1.89*)	(138.35***)			(3,742.73***)	
2	15.3921	-0.4565	-0.0341	0.0033	0.1413	0.0000	0.9922	0.98	756	F(6,749)	2.17
	(3.00***)	(-2.30**)	(-2.65***)	(1.15)	(3.12***)	(-0.36)	(179.90***)			(5,801.24***)	
3	7.3750	2.5673	-0.7545	-0.0016	-0.0257	0.0000	0.9363	0.89	855	F(6,848)	2.04
	(15.97***)	(2.89***)	(-3.68***)	(-0.12)	(-0.56)	(-1.43)	(77.60***)			(1,100.26***)	
4	7.9544	0.3784	-0.4392	0.0141	-0.0654	0.0000	0.9048	0.83	855	F(6,848)	2.05
	(21.38***)	(0.34)	(-1.62*)	(0.34)	(-1.38)	(-1.22)	(61.42***)			(708.71***)	
5	7.5032	2.6951	-0.9525	0.0175	0.0956	0.0000	0.9778	0.96	855	F(6,848)	2.01
	(8.60***)	(2.80***)	(-4.47***)	(0.30)	(2.26**)	(-1.58)	(136.69***)			(3,079.02***)	
6	14.9883	-2.2705	0.1300	0.0638	0.1482	0.0000	0.9867	0.98	855	F(6,848)	1.74
	(3.32***)	(-2.22**)	(0.57)	(2.58***)	(1.27)	(-0.82)	(172.64***)			(5,864.18***)	
7	11.1839	-0.0703	-0.1244	0.0605	-0.0873	0.0000	0.9779	0.95	851	F(6,844)	2.14
	(6.71***)	(-0.07)	(-0.52)	(1.59)	(-1.28)	(2.74***)	(130.26***)			(2,848.82***)	
8	31.2744	4.1648	-1.2591	0.0215	1.6144	0.0000	0.9932	0.99	855	F(6,848)	1.61
	(2.44**)	(9.62***)	(-15.39***)	(1.33)	(3.89***)	(-1.35)	(249.35***)			(11,709.06***)	
9	7.6964	-1.0799	-0.0708	0.0000	-0.0340	0.0000	0.8742	0.76	854	F(6,847)	2.14
	(18.09***)	(-4.32***)	(-4.12***)	(0.02)	(-0.87)	(0.12)	(51.44***)			(460.66***)	
10	7.1308	-0.4554	-0.2328	0.0826	0.0785	0.0000	0.9639	0.93	1,050	F(6,1043)	2.09
	(12.12***)	(-0.65)	(-1.42*)	(2.25**)	(1.14)	(-1.22)	(116.65***)			(2,487.65***)	
11	6.1396	-4.3560	0.5229	0.0521	0.0754	0.0000	0.9645	0.93	801	F(6,794)	1.71
	(7.76***)	(-4.35***)	(2.38***)	(0.85)	(1.25)	(-0.30)	(103.46***)			(1,815.09***)	
12	11.8924	-0.8607	-0.0134	0.0002	0.1151	0.0000	0.8867	0.90	957	F(6,950)	2.68
	(6.86***)	(-2.18**)	(-1.21)	(0.47)	(3.16***)	(0.33)	(57.29***)			(1,481.39***)	
13	11.2361	-2.5440	0.1544	0.0285	-0.1043	0.0000	0.9593	0.92	1,038	F(6,1031)	2.06
	(9.36***)	(-2.36***)	(0.68)	(1.50)	(-1.04)	(-1.57)	(108.99***)			(2,059.56***)	
14	9.1568	-1.9649	-0.0107	-0.0016	-0.0243	0.0000	0.9561	0.92	1,039	F(6,1032)	2.48
	(12.05***)	(-11.09***)	(-0.91)	(-1.22)	(-0.58)	(1.21)	(102.89***)			(1,877.85***)	
15	12.5365	-0.3881	-0.0488	-0.0021	0.1000	0.0000	0.9522	0.92	962	F(6,955)	2.05
	(10.85***)	(-1.87**)	(-2.49***)	(-0.43)	(1.13)	(-0.22)	(91.61***)			(1,734.63***)	
16	20.0591	-0.3626	-0.1216	0.0124	0.9717	0.0000	0.9742	0.97	973	F(6,966)	2.22
	(4.74***)	(-0.75)	(-3.51***)	(1.50)	(5.20***)	(-2.59***)	(131.27***)			(5,035.23***)	
17	4.0203	-1.2848	0.1707	-0.0034	0.0859	0.0000	0.9655	0.94	1,051	F(6,1044)	2.45
	(7.82***)	(-1.38*)	(0.93)	(-0.16)	(1.62)	(-1.34)	(124.43***)			(2,584.78***)	

* denotes significance at the 10% level; ** at 5%; and *** at 1%.

Table 7

Estimation of $SPREAD = \alpha + \beta_1 \Delta VIRA + \beta_2 \Delta VIRB + \beta_3 \Delta PB + \beta_4 VB + \beta_5 BAR + \beta_6 VOL + \varepsilon$ using Hildreth-Lu for 17 active VCTs

No.	*Const.*	*ΔVIRA*	*ΔVIRB*	*ΔPB*	*VB*	*BAR*	*VOL*	*Rho*	*Adj. R^2*	*n*	*F*	*DW*
1	7.6700	-2.0268	0.8603	-0.5670	0.0806	-0.0197	0.0000	0.9882	0.97	723	F(7,715)	1.96
	(2.69***)	(-0.59)	(0.51)	(-1.35*)	(1.94*)	(-0.25)	(1.88*)	(138.36***)			(3,206.29***)	
2	15.4260	-3.7821	-0.4584	-0.0334	0.0033	0.1427	0.0000	0.9922	0.98	756	F(7,748)	2.17
	(3.00***)	(-0.91)	(-2.31**)	(-2.59***)	(1.14)	(3.15***)	(-0.39)	(179.89***)			(4,970.23***)	
3	7.3967	0.5190	2.7766	-0.8020	-0.0015	-0.0272	0.0000	0.9364	0.89	855	F(7,847)	2.03
	(15.95***)	(0.19)	(3.00***)	(-3.75***)	(-0.11)	(-0.59)	(-1.38)	(77.64***)			(942.75***)	
4	7.9917	-2.2279	0.7581	-0.5312	0.0144	-0.0681	0.0000	0.9048	0.83	855	F(7,847)	2.05
	(21.35***)	(-0.71)	(0.63)	(-1.83**)	(0.35)	(-1.44)	(-1.21)	(61.41***)			(607.44***)	
5	7.5760	-2.8784	3.8629	-1.2179	0.0184	0.0886	0.0000	0.9781	0.96	855	F(7,847)	1.99
	(8.63***)	(-1.44*)	(3.77***)	(-5.35***)	(0.31)	(2.10**)	(-1.48)	(137.45***)			(2,668.95***)	
6	14.9325	1.9510	-2.3544	0.1492	0.0640	0.1509	0.0000	0.9867	0.98	855	F(7,847)	1.74
	(3.30***)	(0.32)	(-2.29**)	(0.65)	(2.59***)	(1.29)	(-0.83)	(172.60***)			(5,023.42***)	
7	11.2033	-2.1053	0.0518	-0.1546	0.0607	-0.0865	0.0000	0.9779	0.95	851	F(7,843)	2.14
	(6.72***)	(-0.57)	(0.05)	(-0.63)	(1.60)	(-1.27)	(2.72***)	(130.18***)			(2,439.95***)	
8	31.4427	-11.1551	4.1799	-1.2627	0.0219	1.6007	0.0000	0.9932	0.99	855	F(7,847)	1.61
	(2.45**)	(-1.24)	(9.66***)	(-15.44***)	(1.35)	(3.86***)	(-1.29)	(249.68***)			(10,059.44***)	
9	7.7451	-6.3284	-1.0665	-0.0725	0.0000	-0.0335	0.0000	0.8746	0.76	854	F(7,846)	2.14
	(18.07***)	(-1.37*)	(-4.26***)	(-4.20***)	(-0.01)	(-0.86)	(0.14)	(51.50***)			(395.18***)	
10	7.1215	0.4875	-0.5313	-0.2146	0.0831	0.0779	0.0000	0.9639	0.93	1,050	F(7,1042)	2.09
	(12.10***)	(0.21)	(-0.73)	(-1.27)	(2.26**)	(1.13)	(-1.21)	(116.60***)			(2,130.63***)	
11	6.1447	-5.1248	-4.2645	0.5026	0.0519	0.0764	0.0000	0.9645	0.93	801	F(7,793)	1.71
	(7.76***)	(-1.69**)	(-4.03***)	(2.16**)	(0.85)	(1.27)	(-0.31)	(103.42***)			(1,553.99***)	
12	11.8627	2.4279	-0.8627	-0.0133	0.0002	0.1152	0.0000	0.8867	0.90	957	F(7,949)	2.68
	(6.79***)	(0.11)	(-2.18**)	(-1.20)	(0.46)	(3.16***)	(0.33)	(57.27***)			(1,268.46***)	
13	11.1826	4.1155	-2.7717	0.2043	0.0283	-0.1052	0.0000	0.9594	0.92	1,038	F(7,1030)	2.07
	(9.30***)	(0.73)	(-2.53***)	(0.88)	(1.49)	(-1.05)	(-1.58)	(109.06***)			(1,766.33***)	
14	9.2253	-10.1996	-1.9416	-0.0125	-0.0016	-0.0249	0.0000	0.9563	0.92	1,039	F(7,1031)	2.49
	(12.09***)	(-2.64***)	(-10.95***)	(-1.06)	(-1.25)	(-0.59)	(1.29)	(103.11***)			(1,615.79***)	
15	12.5369	-0.4423	-0.3880	-0.0488	-0.0021	0.1000	0.0000	0.9522	0.92	962	F(7,954)	2.05
	(10.83***)	(-0.07)	(-1.87**)	(-2.48***)	(-0.43)	(1.13)	(-0.22)	(91.56***)			(1,485.27***)	
16	20.0929	-4.2012	-0.3615	-0.1214	0.0124	0.9715	0.0000	0.9742	0.97	973	F(7,965)	2.22
	(4.74***)	(-0.32)	(-0.75)	(-3.50***)	(1.50)	(5.20***)	(-2.58***)	(131.23***)			(4,311.84***)	
17	3.9900	2.4115	-1.7629	0.2645	-0.0046	0.0869	0.0000	0.9657	0.94	1,051	F(7,1043)	2.44
	(7.73***)	(1.08)	(-1.83**)	(1.39*)	(-0.22)	(1.64)	(-1.39)	(124.71***)			(2,220.91***)	

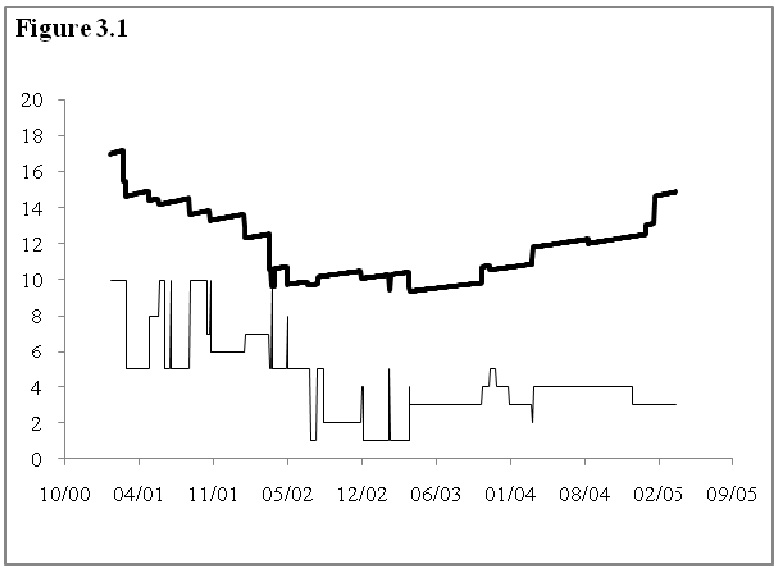
* denotes significance at the 10% level; ** at 5%; and *** at 1%.

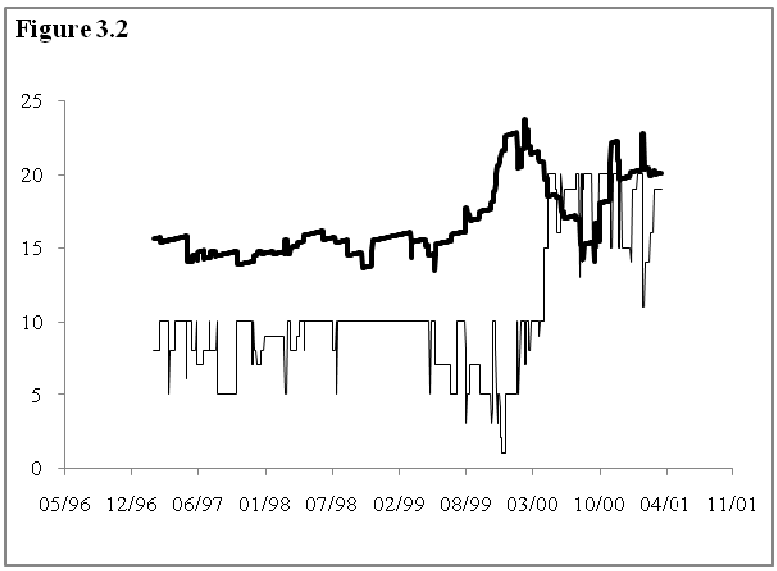
Figure 3

Plot of *SPREAD* and *VIR* for seventeen 'active' VCTs (pence)

Data from investment relief cash flow benefit date to end of required holding period

(key: *SPREAD* plots in plain; *VIR* plots in bold)





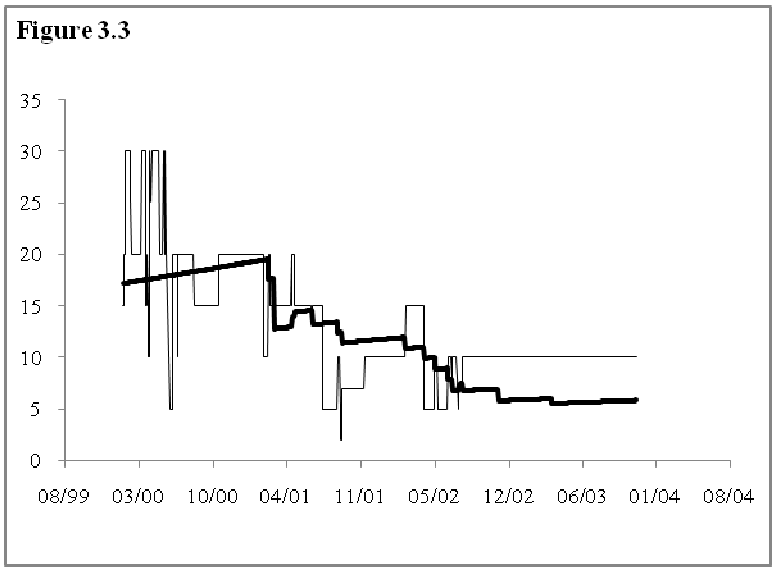


Figure 4
HIstogram of deviation of *SPREAD* from *VIR* (pence)