Fair Value Accounting, Earnings Volatility, and Stock Price Volatility

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Current draft: June 2015

Abstract: This paper examines the effect of fair value accounting and issues with its implementation on the volatility of stock prices. The extant literature shows that investors use earnings volatility in their risk assessments, and that earnings volatility and stock price volatility are strongly correlated. Fair value accounting is argued to facilitate investors' risk assessment through transparent reporting of underlying economic income. However, regulators are concerned that fair value accounting can make firms appear more volatile than they actually are. This paper uses the U.K. investment trust setting to derive a theoretical relationship between stock price volatility and the volatility of fair value earnings components. It then examines whether the effect of fair value earnings components on stock price volatility is consistent with theoretical predictions. I find that stock price volatility is higher than the volatility of fair value earnings, and that this effect is due to an unrealized (fair value) earnings component. This finding appears to be driven (in part) by the lack of accuracy of some fair value estimates and the artificial earnings volatility due to a mismatch between assets measured at fair value and liabilities measured at historical cost. I corroborate this result by showing that fair value earnings lead to greater stock price volatility when investment trust shares are traded by unsophisticated investors and are followed by fewer analysts.

Key words: fair value accounting, earnings volatility, stock price volatility, investor sophistication, accounting mismatch.

Acknowledgments: I thank Dan Collins, Peter Fiechter, Joachim Gassen, Christian Leuz, John O'Hanlon, Steve Young and seminar participants at the EAA Annual Meeting, Humboldt University of Berlin, Lancaster University and WHU. I thank ICAEW for providing generous support for this project.

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1. Introduction

The purpose of financial accounting is to facilitate investors' risk assessments. The extant literature shows that markets use a firm's accounting information to assess investment risk and that there is a high correlation between stock price volatility and earnings volatility (Beaver et al., 1970; Ryan, 1997). Reporting fair value adjustments in income is expected to increase transparency and to produce income figures that are closely aligned with underlying economic activity. However, the introduction of fair value accounting is expected to substantially increase the volatility of a firm's income (Barth et al., 1995; Hodder et al., 2006), and prior studies question whether this increased volatility facilitates investors' risk assessments (Ryan, 1997). Similarly, regulators are concerned that fair value accounting can make firms' businesses appear more volatile than they actually are, which can increase stock price volatility (European Central Bank, 2004). In this regard, Plantin et al. (2008) conclude that the key issue in the fair value debate is whether fair value accounting introduces excess volatility into the markets. This study uses U.K. investment trusts to examine the effect of fair value accounting and issues with its implementation on the volatility of stock market returns.

A common line of argument among regulators and academics suggests that certain implementation issues that arise when a fair value regime is adopted can artificially increase the volatility of earnings. Two characteristics of fair value accounting can introduce noise in income measurement. First, any gains (losses) on fair-valued assets should be matched to offsetting losses (gains) on liabilities. For example, in a declining market, any decrease in asset value is accompanied by a decrease in the value of discounted liabilities due to increasing risk and interest rates. A decrease in asset value results in a loss, while a decrease in liabilities equates to a gain.

If assets are carried at fair value and related liabilities are carried at historical cost, financial statements account only for changes in asset values, resulting in a mismatch that artificially increases the volatility of reported earnings (Barth and Landsman, 1995; Hodder et al., 2006; Blankespoor et al., 2013). Second, fair value earnings will be biased when fair values are estimated with an error or are manipulated (Landsman, 2007; Danbolt and Rees, 2008). For example, the use of valuation models or comparable prices requires substantial judgment. Such valuations can lead to the inclusion of erroneous gains and losses in income, which can increase earnings volatility.[1]

A measure of true earnings volatility thus requires the unravelling of how individual earnings components contribute to overall earnings volatility. If investors use aggregate earnings but underreact to information on earnings components, as has been reported in the literature (Sloan, 1996; Xie, 2001), stock price volatility can deviate from the level implied by the volatility of underlying economic income. In the example above, the implementation of fair value measurements in an otherwise historical cost environment may result in excess stock price volatility if investors fail to account for any offsetting gains or losses in liabilities. There is little prior evidence regarding whether the implementation of fair value accounting increases stock price volatility. The European Central Bank (ECB) questions the market's ability to correctly reflect the increased volatility of income due to introduction of the fair value measurement (European Central Bank, 2004). Specifically, the ECB argues that some issues with implementing fair value accounting can unduly increase the volatility of stock returns if stock markets fail to decompose earnings into components and clarify how the volatility of the earnings components reflects the underlying risk. However, descriptive evidence provided by the ECB

[1] Alternatively, firms may smooth income using their discretion in estimating fair values based on unobservable inputs. This will result in a smoother income pattern that fails to reflect true underlying risks.

does not support the prediction that stock price volatility increases upon the introduction of fair value accounting.

A related, but novel, line of argument suggests that the use of fair value measurement per se – in the absence of implementation issues – can lead to increased stock price volatility. Plantin et al. (2008) show that fair value accounting can increase stock price volatility if it affects the investment decisions of banks that mark their assets to market values. Relatedly, Ball et al. (2012) argue that, although fair value is a sufficient statistic, fair value gains and losses can come from a number of sources. Fair values are based on underlying asset returns that can be decomposed into future cash flow shocks and future discount rate shocks (Campbell and Shiller, 1988; Campbell, 1996). Because these shocks have different implications for future returns, a "… mark-to-market number might be quite different in a world driven by discount-rate variation than in a world driven by cashflow variation" (Cochrane, 2011: 1088). Hodder et al. (2013) illustrate how the effect of fair value changes on future performance depends on the nature of the fair value adjustment. For example, a fair value loss on a bond due to an interest rate increase leads to a persistent stream of earnings that captures higher future interest income. A fair value loss due to a cash flow shock is followed by lower future dividend income. Hodder et al. (2013) argue that it is difficult to know what drives fair value changes and argue that this lack of knowledge may affect research inferences in regard to the usefulness of fair value measurements. Such confusion is especially likely for investment companies that report an aggregate fair value change for a portfolio composed of many different (types of) financial assets. To the extent that some market participants misinterpret fair value changes, the volatility of stock prices may exceed the volatility of underlying fair value earnings.

I use a sample of U.K. investment trusts (also known as closed-end funds) to shed new light on the relationship between fair value accounting and stock price volatility. Investment trusts are

listed companies that issue shares and use the proceeds from share issues to invest in a portfolio of financial assets. The U.K. investment trust industry is well developed, consisting of more than 450 such companies as of December 31, 2014, and managing assets of about £122 bn. Using the investment trust industry offers three advantages. First, investment trusts report assets predominantly at fair value, while liabilities are reported at historical cost. Second, there is variation in the use of fair value measurements, as investment trusts hold listed investments measured using observable prices and unlisted investments measured using valuation techniques. Third, the setting provides a methodological advantage over common approaches used to test stock price volatility. In the prior literature, the law of one price is used to show that the market value of an investment trust should equal its net asset value (Malkiel, 1977; Pontiff, 1995; Pontiff, 1997). I use this theoretical relationship as a starting point for an empirical model that links the volatility of earnings components to the volatility of stock returns. Critically, the model allows predicted theoretical values to be derived for the empirical coefficient estimates, to probe the market pricing of earnings volatility. This offers a refinement relative to models used in prior studies.

I use data on 155 U.K. investment trusts over the period 1991–2013 and compute the variance of stock returns and earnings components for each fund over a 10-year period using a rolling window. The key measure of an investment trust's performance is its net asset value (NAV) return, which measures the percentage change in NAV (the trust's equity) over the year. Following the variance decomposition framework and the structure of the investment trusts' income statements, I decompose the variance of NAV returns into variances and covariances of the following individual earnings components: unrealized fair value gains/losses, realized gains/losses on portfolio holdings, and other income, representing dividend income less

management fees. I focus on the volatility of unrealized fair value adjustments so as to examine how fair value measurements affect stock price volatility.

Similarly to Pontiff (1997), I find that stock prices of investment trusts are more volatile than NAV returns. My subsequent analysis aims to identify sources of this "excess" volatility. I show that the excess stock price volatility is related to the unrealized (fair value) component of funds' earnings. In turn, the relation between the volatility of realized gains/losses and the volatility of stock prices is in line with theoretical predictions. I find that these results are not sensitive to the presentation format of unrealized and realized fair value earnings components (i.e., the use of recycling). Critically, I control for other factors that could lead to a deviation of the stock price from the NAV in the closed-end fund setting, including market sentiment, management trading skills, the fees investment trusts charge for managing assets, and other risk proxies.

I next exploit the variation in the use of historical cost accounting to measure liabilities, and the variation in the accuracy of fair value estimates to explain why unrealized gains/losses contribute to excess stock price volatility. I find that measuring assets at fair value while using the historical cost for liabilities increases earnings volatility. This result is consistent with the prediction that an accounting mismatch increases earnings volatility. I show that this excess earnings volatility is not corrected by investors and leads to higher stock price volatility. I next use two proxies for the accuracy of fair value estimates: My primary accuracy measure is the extent to which current unrealized gains/losses are able to predict future realized gains/losses (Evans et al., 2014). My secondary measure is the exposure of the balance sheet to unobservable fair value inputs (Goncharov et al., 2014). I find that fair value estimates that are able to predict future realized income lead to lower earnings volatility and lower volatility of stock prices.

Finally, I examine whether the limited-attention explanation for the stock market response to accounting information leads stock prices to be more volatile in the case of fair value earnings

(Hirshleifer and Teoh, 2003). I predict and find that the excess stock price volatility is substantially attenuated when sophisticated investors hold fund shares and when the information environment is richer (proxied by a greater analyst following). Overall, my results suggest that some investors fail to fully incorporate fair value volatility into stock prices and this result is partly due to a lack of reliability of some fair value estimates and the accounting mismatch that results from implementing fair value measurements in the otherwise historical cost setting.

It is important to note that the results of this study should not be interpreted as a general criticism of fair value measurement. This study examines excess stock price volatility only for firms that predominantly report under the fair value regime in a rather transparent environment in which most values are readily available. Given that investors fail to fully incorporate earnings volatility into stock prices in this transparent setting makes it likely that excess stock price volatility is also pronounced in other settings with less transparent reporting and complex measurement problems. In this regard, interpreting the volatility of historical cost earnings poses a number of challenges, such as understanding the true volatility of individual earnings components and correcting for the excess earnings volatility that results from the use of accounting estimates and the expensing of some intangible assets (Chan et al., 2001). Thus, historical cost earnings may lead to even greater stock price volatility than fair value earnings.

My findings contribute to the prior literature in two ways. First, I propose a novel test of the market response to the volatility of earnings components. While there is ample evidence on the link between market measures of risk and earnings volatility (Beaver et al., 1970; Barth et al., 2008), it is not well understood how investors incorporate earnings volatility into stock prices. Accounting standards and reporting discretion introduce noise into income measurement as they may lead to a mismatch between revenues and related expenses. In this regard, Callen and Segal (2004) and Callen et al. (2006) find that investors incorporate the information from major

earnings components into stock prices. Similarly, Hodder et al. (2006) find that investors incorporate the information that is found in the volatility of the fair value earnings component into stock prices. However, these studies do not reveal whether the information is fully incorporated or whether the noise in the income affects investors' assessments of firm risk.

Second, I contribute to the prior literature by analyzing how the implementation of fair value reporting affects investors' risk assessments. Prior studies show that fair value accounting – when applied to assets and liabilities – results in income that more closely captures underlying risks (Barth et al., 2008). However, the measurement risk inherent in subjective mark-to-model estimates leads to a higher cost of capital (Riedl and Serafeim, 2011). Thus, my results deepen our understanding of when fair value accounting can affect the volatility of stock prices.

Third, my results extend prior research on the determinants of excess stock price volatility (Pontiff, 1997; Agyei-Ampomah and Davies, 2005). My results show that excess stock price volatility of closed-end funds is partly explained by noise traders' reaction to information concerning fair value adjustments.

The paper proceeds as follows. Section 2 reviews the prior literature on earnings volatility as the determinant of stock price volatility. Section 3 describes the research setting and the investment trust industry. Section 4 introduces the theoretical model and derives the empirical model. Section 5 develops hypotheses, while sample selection and descriptive statistics are presented in Section 6. Results are reported in Section 7. Section 8 summarizes my findings.

2. Stock prices and volatility of income

Financial statements can inform investors about risk by reporting the volatility of income and by providing additional disclosures that can help investors to better understand the sources of earnings volatility. A large body of literature, starting with Beaver et al. (1970) and Beaver and

Manegold (1975), examines how financial statements inform markets about underlying risks. For example, Ball and Brown (1969) conclude that earnings volatility explains about 40% of the variability in market betas. Ryan (1997) reviews the literature linking accounting and market measures of risk and concludes that income variability is more strongly related to systematic equity risk than any other accounting risk measure.

Given that earnings volatility is the major covariate of market risk, early studies call for more evidence on how markets incorporate accounting volatility into stock prices. In this regard, Callen and Segal (2004) and Callen et al. (2006) decompose earnings volatility into the volatility of accruals and the volatility of cash flows, and conclude that both are incorporated into stock prices. Moreover, the authors find that the correlation with market volatility is stronger for cash flow volatility than for accrual volatility. Hodder et al. (2006) use a sample of U.S. banks and assess the volatility of historical-cost income and the incremental volatility of income when income is remeasured using a full fair value basis. They find that fair value earnings are substantially more volatile, and that higher earnings volatility leads to a higher volatility of stock returns. Hodder et al. (2006) conclude that this incremental volatility of fair value accounting is partly explained by the fair value model's better ability to capture underlying risks. However, the ECB questions the financial market's ability to correctly reflect the increased volatility of income due to the introduction of fair value measurement (European Central Bank, 2004). Consistent with this concern, Plantin et al. (2008) show that fair value accounting can lead to excess price volatility under certain conditions.

This study extends the prior literature concerning the relationship between accounting-based and market-based measures of risk in several ways. While the prior literature tests the link between earnings volatility and stock price volatility, it fails to predict the magnitude of this relationship (Ryan, 1997; Hodder et al., 2002). For example, Beaver and Manegold (1975)

caution that the estimates are likely to be biased because of the error in accounting measures of risk. I use a novel test that allows me to assess whether markets fully incorporate information about earnings volatility into stock prices. I also examine how earnings measurement issues affect investors' risk assessments.

3. Investment trust setting

Unlike prior studies, I use U.K. investment trusts to probe the relationship between stock price volatility and the volatility of fair value earnings components. The U.K. investment trust industry is well developed. Calculating a stable estimate of earnings volatility requires a long time series with available data. This is the case in the U.K., where investment trusts, similarly to other listed companies, are required to publish their financial statements using U.K. GAAP.[2] Investment trusts provide a unique setting in which to test how markets assess the firm risk reflected in earnings volatility. Investment trusts issue shares to investors – which are subsequently traded on the secondary market – and invest the proceeds in a portfolio of equity instruments. As a result, the balance sheet of an investment trust has a simple structure and one major line item – investment in financial assets – which accounts for more than 90% of total assets. Most of those equity investments are listed and are marked to observable market prices, while the fair value of unlisted investments is determined by reference to comparable market prices or by using a valuation model. Changes in the fair value of financial investments are reported in the income statement. Most investment trusts do not have material interests in subsidiaries and therefore were exempt from the IFRS adoption requirements and continue to prepare their unconsolidated financial statements under U.K. GAAP. A minority of trusts

[2] There is a comparable number of equity closed-end funds listed on the U.S. market. However, U.S. closed-end funds have been required to report their financials as form N-CSR (which is similar to the 10-K filings of industrial companies) only since 2003.

preparing consolidated financial statements switched to IFRS following its adoption in 2005, making a few changes in the U.K. GAAP to IFRS transition.[3] This implies a long history of reporting under the fair value model.

The main financial performance measures for investment trusts are net asset value (NAV) and net income, which is used to calculate the total return on the net asset value (NAV return). NAV captures the current market value of the investment portfolio less liabilities. Net income consists of fair value gains and losses (capital income) and other non-fair-value earnings components (revenue income) such as dividend income, administrative costs, management fees, and interest expense. Based on footnote disclosure, the fair value gains and losses can be further decomposed into (i) unrealized fair value gains and losses (i.e. valuation increments) and (ii) realized gains and losses relative to the historical cost of securities sold during the period. I focus on unrealized fair value gains and losses to capture the effect of fair value accounting on income and stock price volatility. Investment trusts are exempt from corporate tax on fair value gains and dividend income if they fulfill certain requirements. For example, the tax exempt status requires distribution of most of the revenue income and prohibits distribution of fair value gains (Cheng et al., 1994). As a result, the investment trusts' income and NAV return can be decomposed into unrealized gains/losses on the investment portfolio, realized gains/losses on the investment portfolio, and other non-fair-value income. Realized and unrealized fair value gains/losses are major earnings components, constituting about 85% of NAV returns.

[3] IFRS financial statements do not report a liability for proposed dividends, which affects the calculation of the NAV. Furthermore, financial investments are stated at the bid price under IFRS, while U.K. GAAP requires investments to be carried at the mid price.

4. Model development

As most of the investment trusts' assets are marked to observable market prices, the NAV of an investment trust should equal its market value. That is, based on the law of one price, the value of the investment trust should equal the value of the underlying investment portfolio. Consequently, a large body of literature uses the relationship between the market value of an investment trust and its NAV to examine whether markets fully incorporate the information about underlying asset values into stock prices (Malkiel, 1977; Lee et al., 1991; Cheng et al., 1994; Pontiff, 1995; Gemmill and Thomas, 2002). Another stream of literature focuses on the volatility of NAV returns (Pontiff, 1997; Sias et al., 2001) as a refinement of Shiller's excess volatility test (Shiller, 1989). Pontiff (1997) argues that, because the law of one price renders the share price equal to the NAV, the volatility of share price changes should be equal to the volatility of NAV returns. Pontiff (1997) uses the U.S. closed-end fund setting to examine whether there is excess volatility in share prices, that is, whether the volatility of stock price returns is higher than the volatility of the underlying portfolio captured by the volatility of NAV changes. While most prior findings pertain to U.S. closed-end funds, similar results are found for U.K. investment trusts (Draper and Paudyal, 1991; Cheng et al., 1994; Agyei-Ampomah and Davies, 2005).

My proposed theoretical model is similar to that in Pontiff (1997). I start by arguing that the law of one price dictates that the value of an investment trust (P) is equal to the value of the underlying investment portfolio (NAV):

$$P = NAV. \tag{1}$$

Pontiff (1997) further shows that the law of one price implies that changes in share prices (Ret) and changes in net asset value (NAV_ret) are equal. This suggests that the variance of stock returns is equal to the variance of NAV returns:

$$var(Ret) = var(NAV\_ret). \tag{2}$$

Following the structure of investment trusts' income statements, NAV returns can be decomposed into fair value gains and losses (*FVGL*) and other income (*OI*). Fair value gains/losses can be further decomposed into unrealized gains/losses (*UGL*) (i.e., fair value adjustments) and realized gains/losses (*RGL*), leading to the following equation:

$$NAV\_ret = FVGL + OI = (UGL + RGL) + OI. \quad (3)$$

Equation (3) identifies three major earnings components that affect investment trusts' performance. I next calculate the variance of the income variables on both sides of equation (3). Using the variance decomposition framework, the variance of the sum of earnings components equals the sum of the variances of the individual components and the covariance between the earnings components:

$$\begin{aligned} var(NAV\_ret) &= var(FVGL + OI) \\ &= var(FVGL) + var(OI) + 2 \times cov(FVGL;OI). \end{aligned} \quad (4)$$

Similarly, the variance of the fair value gains and losses can be further decomposed into the variance of unrealized gains/losses, the variance of realized gains/losses, and the covariance between unrealized gains/losses and realized gains/losses:

$$\begin{aligned} var(NAV\_ret) = {} & var(UGL) + var(RGL) + 2 \times cov(UGL;RGL) \\ & + var(OI) + 2 \times cov(FVGL;OI). \end{aligned} \quad (5)$$

Finally, substituting *var(Ret)* for *var(NAV_ret)* in equation (5) and recording the multiples on individual parameters leads to the following testable prediction:

$$\begin{aligned} var(Ret) = {} & 0 + 1 \times var(UGL) + 1 \times var(RGL) + 2 \times cov(UGL;RGL) \\ & + 1 \times var(OI) + 2 \times cov(FVGL;OI). \end{aligned} \quad (6)$$

Equation (6) is used to specify my empirical model as follows:

$$\begin{aligned} Ret\_var_{it} = {} & \alpha_0 + \alpha_1 UGL\_var_{it} + \alpha_2 RGL\_var_{it} + \alpha_3 OI\_var_{it} \\ & + \alpha_4 cov(UGL;RGL)_{it} + \alpha_5 cov(FVGL;OI)_{it} + \varepsilon_{it}, \end{aligned} \quad (7)$$

where Ret_var_{it} is the variance of the stock market returns of investment trust i during the measurement interval t. The stock market returns are equal to the percentage change in the stock price during the fiscal year. UGL_var_{it} (RGL_var_{it}) is the variance of unrealized (realized) fair value gains/losses scaled by the lagged NAV. OI_var_{it} is the variance of other income. Other income is calculated as the difference between NAV returns (percentage change in NAV) and fair value gains/losses scaled by the lagged NAV. $Cov(RGL;UGL)_{it}$ is the covariance between realized gains/losses and unrealized gains/losses. $Cov(FVGL;OI)_{it}$ is the covariance between fair value gains/losses and other income. Model (7) uses annual data and 10-year rolling windows to obtain stable variance estimates.[4]

Model (7) examines whether the relationship between the stock market volatility and the volatility of the earnings components is consistent with equation (6). According to equation (6), investors fully incorporate the volatility of earnings components into stock prices if $\alpha_1 = 1$, $\alpha_2 = 1$, $\alpha_3 = 1$, $\alpha_4 = 2$, and $\alpha_5 = 2$. The intercept is predicted to equal zero ($\alpha_0 = 0$) if there are no factors that explain stock price volatility beyond the level captured by earnings volatility. Turning to fair value accounting, the coefficient on UGL_var will show whether fair value accounting can increase stock price volatility. For example, finding that $\alpha_1 = 1$ will allow me to conclude that markets fully incorporate the information contained in the volatility of fair value adjustments into stock prices and that fair value implementation issues, *on average*, do not affect stock price volatility. In turn, a value of α_1 that is different from one could point to fair value implementation issues or market frictions that may mislead investors in their risk assessments. For example, finding that $\alpha_1 > 1$ will be consistent with the conjecture that fair value accounting increases stock market volatility (Plantin et al., 2008).

[4] The use of a rolling-window approach induces clustering of information at the firm level, which can bias standard error estimates. To correct for this bias, the regressions use standard errors clustered at the firm level (Petersen, 2009).

While the equivalence of price and NAV in equation (1) follows the law of one price, it is not consistent with the empirical evidence that closed-end funds frequently trade at a discount or a premium relative to their NAV. As a result of this empirical regularity, the volatility of stock prices will be higher or lower than the volatility of stock returns. Thus, model (7) could be seen as an empirical attempt to link any differences between the stock price volatility and the volatility of underlying assets to the individual earnings component. However, estimating the model (7) can lead to false inferences in regard to my research question if the model fails to control for factors that cause NAV discount/premium and that are correlated with fair value measurements. My research design controls for such factors in three ways: First, I allow model (7) to have a non-zero intercept that varies over time, to capture the effect of other determinants of incremental stock price volatility. Second, I extend model (7) to include a set of control variables motivated by the prior literature on the determinants of the NAV discount/premium most notably market sentiment, management ability, management fees, and other risk proxies.

Third, I employ a research design similar in essence to a difference-in-differences analysis. I argue that if factors unrelated to accounting measurement preclude me from estimating the true relationship between fair value earnings and stock price volatility then they should equally bias the coefficients on unrealized gains/losses and realized gains/losses. For example, the movements in investor sentiment explanation for excess stock price volatility is based on the model where investors either overestimate or underestimate expected returns (Lee et al., 1991). This model does not predict that investors attach differential weights to current components of accounting returns. In other words, there is no reason to expect why market sentiment or other factors will bias the coefficient on unrealized gains/losses but not the coefficient on realized gains/losses. Thus, I estimate the difference between the coefficient on

unrealized gains/losses and the coefficient on realized gains/losses to purge the effect of other factors.

5. Hypothesis development

Issues related to the implementation of fair value measurements may lead the coefficient on fair value adjustments in model (7) to deviate from its predicted theoretical value. Accounting for fair value gains (losses) on assets but not for offsetting losses (gains) on liabilities can artificially increase the volatility of net income (Barth et al., 2008). Investment trusts use a mixed measurement approach in their financial statements and use fair value for financial investments, but historical cost for liabilities. Measuring fair value increments on assets, while carrying liabilities at historical cost, can lead to greater earnings volatility. If some investors fail to adjust for this effect, the increased earnings volatility can translate into higher stock price volatility. Additionally, the accuracy of fair value estimates can affect earnings volatility and stock price volatility. Investment trusts hold material investments in unlisted securities, and have substantial discretion in estimating their value based on a valuation model or comparable prices. The prior literature shows that firms use this discretion to overstate asset values (Ramanna and Watts, 2012). Intentional and unintentional estimation errors in current earnings will need to be corrected in future earnings, which will lead to excess earnings volatility (Ball et al., 2012).[5] When assets are quoted and have observable market prices, managers can affect the valuations by manipulating the underlying prices in imperfectly liquid markets (Heaton et al., 2010; Ball et al.,

[5] Alternatively, firms can use their discretion in estimating fair values so as to smooth earnings (Graham et al., 2005). Such appraisal smoothing has been discussed previously in the context of valuing investment properties (Pagliari et al., 2003). Thus, it is an empirical matter whether the use of fair values based on unobservable fair value estimates leads to higher or lower earnings volatility, which in turn will affect stock price volatility.

2012). If this occurs, the stock price volatility will again deviate from the volatility implied by the riskiness of the underlying assets.

While most prior concerns about stock price volatility relate to issues of fair value implementation, some contemporaneous studies question whether the use of fair value measurement affects stock price volatility (Plantin et al., 2008). Ball et al. (2012) show that fair value accounting can lead to greater information asymmetry if some investors fail to understand the nature of a fair value change. Because fair value changes emerge due to future cash flow shocks and future discount rate shocks (Campbell and Shiller, 1988; Campbell, 1996), investors require information on the nature of the fair value change for each underlying investment in order to correctly incorporate the fair value changes into the stock prices. As this information is not readily available, some investors may misinterpret the fair value signal and their trades will lead to excess stock price volatility. In a related line of argument, Hodder et al. (2013) explain how the effect of fair value changes on future performance depends on the nature of fair value adjustment, and how a failure to understand the nature of fair value adjustments may lead to false research inferences. I formulate the null form of my hypotheses as follows:

Hypothesis 1: Unrealized fair value adjustments increase stock price volatility.

Hypothesis 2: The use of mixed measurements increases stock price volatility.

Hypothesis 3: Erroneously estimated or manipulated fair value estimates increase stock price volatility.

The above discussion frequently assumes investors have the ability to decompose earnings volatility into its components and to understand the sources of earnings volatility. This is a costly task as information on the portion of earnings volatility that is due to underlying

economics or noise is not readily available. Hirshleifer and Teoh (2003) argue that investors are more likely to fully incorporate accounting information into stock prices when they invest greater time and effort in financial statement analysis. Prior studies show that, given that the costs of data collection and analysis are high, some investors fail to fully incorporate the implications of earnings components into stock prices (Sloan, 1996). In this regard, the prior literature distinguishes between sophisticated investors with more time and resources devoted to financial statement analysis, and uninformed "noise" traders. It then shows that sophisticated investors are more likely to unravel accounting distortions, mitigating any mispricing (Collins et al., 2003; Hirshleifer and Teoh, 2003; Ali et al., 2008). For example, Green et al. (2011) find that the disappearance of the accrual anomaly in Sloan (1996) is due to hedge funds trading shares with extreme accruals. I predict that any impact of fair value accounting on excess stock price volatility will be less pronounced for firms that are predominantly held by institutional investors.

Hypothesis 4: Investor sophistication reduces the effect of fair value accounting on excess stock price volatility.

6. Sample selection and descriptive statistics

The sample selection procedure is reported in Table 1. I obtain a list of 594 U.K. investment trusts (SIC = 6726) from Datastream and retain 563 funds that have data available on total assets and market price. I then collect financial statements for those funds that have at least 10 consecutive years of them over the period 1991–2013. I collect information on earnings components, reconciliation of fair value balances, and categories of fair value investments from the financial statements of 176 funds (3,057 fund-year observations), and use other accounting and market pricing data from Datastream. The data on analyst following is from I/B/E/S.

Eliminating funds missing the financial statement information needed to construct the test variables leads to a sample of 155 funds and 2,471 fund-year observations. I use this sample to estimate the volatility of stock returns, the volatility of earnings components, and the covariance between earnings components. To obtain stable estimates of the variances and covariances, I use 10-year rolling windows, which results in a test sample of 1,125 observations. Finally, eliminating outliers in the 1st and 99th percentiles of the distributions of the main test variables reduces the sample to 1,059 fund-year observations.

- Insert Table 1 about here -

The median fund included in the sample reports total assets of £333.3 mil. and carries 96% of total assets as fair value investments. Fair value gains and losses on these investments are reported as the first line item of an investment trust's income statement. The footnote disclosures of investment trusts report a decomposition of fair value gains/losses into unrealized gains/losses and realized gains/losses. To assess the importance of individual earnings components for funds' net income, I divide the absolute value of an earnings component by the sum of the absolute values of the unrealized gains/losses, realized gains/losses, and other income. I find that a fund's income is predominantly affected by unrealized gains/losses (mean = 52%) and realized gains/losses (mean = 32%). The income statement also reports investment income (dividends and interest), management fees, and foreign taxes on investment income, which I subsume into the category "other income."

Table 2 reports the descriptive statistics for the investment trusts included in the sample. I find that stock market returns are more volatile than NAV returns (0.103 vs. 0.093). To provide a formal test of excess stock return volatility, I estimate the average logarithm of the ratio of the stock price volatility to the volatility of NAV returns. Examining the log ratio reduces skewness in the distribution of the ratio (see Pontiff, 1997). The mean log ratio should be greater than zero

when the volatility of stock returns is higher than the volatility of NAV returns. I find that the mean of the log ratio is 0.259 (t-test > 0: 11.03), which corresponds to a 28% higher volatility of stock price returns than NAV returns. This evidence confirms prior results in Pontiff (1997) using recent U.K. data. I also find that the volatility of unrealized gains/losses contributes significantly to the volatility of NAV returns (0.075). The volatility of realized gains/losses is substantially lower (0.019). The data further indicate a positive correlation between the fair value earnings components. The median covariance between realized gains/losses and unrealized gains/losses is 0.020. However, further analysis indicates that there is a high degree of dispersion of the covariances among the investment trusts. For example, the correlation between realized gains and unrealized gains varies between –22% (lowest quartile) and 30% (highest quartile). Turning to other income, I find that its median volatility is 0.016, while the covariance between it and fair value gains and losses is –0.003.

- Insert Table 2 about here -

Finally, Table 2 reports the fair value characteristics of the sample firms and shows that unlisted investments that require unobservable fair value estimates constitute 8.8% of total investments. The average ratio of liabilities to fair-valued investments – my measure of accounting mismatch – is equal to 14.5%.

7. Stock price volatility and volatility of fair value earnings

7.1 Do fair value adjustments increase stock price volatility?

I use the law of one price and the variance decomposition framework to examine whether fair value adjustments increase stock price volatility. I estimate a regression of stock return volatility on the volatility of the fair value earnings components and compare the empirical coefficients on the regression variables to their theoretical values. The empirical coefficient on

unrealized gains/losses will equal its theoretical value when fair values measure underlying value creation without error and when investors fully incorporate information regarding fair value earnings into stock prices. In turn, if investors recognize that certain implementation issues make fair value adjustments more volatile than the underlying economic returns, then I expect that the empirical coefficients will be below their predicted values – that is, investors will discount any artificial volatility of fair value adjustments. Finally, if some market frictions hinder investors from fully incorporating earnings volatility into stock prices, I predict that the coefficients will exceed their theoretical counterparts. Table 3 tests these predictions. All specifications cluster standard errors at the firm level, and control for the intercept and period fixed effects.[6]

Column (1) of Table 3 reports a regression of stock price volatility on the volatility of the fair value earnings component and the volatility of other income. Recall that the theoretical value of the coefficients on the volatility measures is 1, and the expected coefficient on the covariance is 2. Column (2) reports a formal test of these predictions. I find that markets overweigh the volatility of fair value earnings (coeff. 1.256) and underweigh both the volatility of other income (coeff. 0.504) and the covariance between fair value earnings and other income (coeff. 1.616). The higher-than-expected coefficient on fair value adjustments is consistent with hypothesis 1 and the view that fair value accounting may increase stock price volatility. Alternatively, this result may be due to income smoothing, which artificially lowers earnings volatility, and the fact that sophisticated investors attach a greater-than-expected multiple to the volatility of fair value earnings to adjust for this effect.

To further probe the relationship between fair value measurements and stock price volatility, column (3) decomposes the variance of fair value gains/losses into the variance of

[6] Constraining the intercept to equal zero as in the theoretical model (6) does not change the inferences drawn from the analysis.

unrealized gains/losses, the variance of realized gains/losses, and the covariance between unrealized and realized gains/losses. I find that investors' pricing of unrealized earnings volatility (coeff. 1.318) explains why the coefficient on fair value earnings exceeds its theoretical value (F-test = 7.35). To identify the relationship between fair value adjustments and stock price volatility, I use an approach that follows the logic of the difference-in-differences research design. My predictions pertain only to unrealized fair value adjustments and not to realized gains/losses. I conjecture that, if factors *unrelated* to accounting and fair value measurement drive excess stock price volatility, those factors should equally affect the pricing of the realized and unrealized earnings components. Thus, I check whether the difference between the coefficient of the fair value adjustments and its theoretical value in model (7) is higher than the difference between the coefficient on realized gains/losses and its theoretical value. Table 3 shows that the coefficient on the realized income component is very close to its theoretical value of 1 in economic and statistical terms (coeff. 0.970; F-test = 0.04). I further find that the coefficient on unrealized fair value volatility is further away from its theoretical value than is the coefficient on realized earnings volatility (0.267 vs. 0.030; t-test = 1.75, $p < 0.1$). The fact that markets fully incorporate the volatility of realized gains/losses, but overreact to the volatility of unrealized gains/losses suggests that fair value accounting may be causing excess stock price volatility. These findings support hypothesis 1.

- Insert Table 3 about here -

Before conducting further tests with the aim of explaining why unrealized gains/losses lead to excess stock price volatility, I expose the preliminary findings shown in Table 3 to a battery of sensitivity tests and report this analysis in Table 4. First, I examine whether other fund characteristics lead to excess stock price volatility. I control for other risk factors in column (1) (Fama and French, 2010). I use market-wide returns, size, and the NAV discount as risk factors

affecting the cross-section of closed-end fund returns. Furthermore, the prior literature suggests that changes in sentiment, management talent, and management fees can affect the stock prices of closed-end funds (Lee et al., 1991; Dimson and Minio-Paluello, 2002; Berk and Stanton, 2007). Column (2) uses management fees as a measure of management compensation and average returns as a proxy for management skills. Similarly to Lee et al. (1991), I use the average NAV discount across funds as a proxy for market sentiment in column (3). I then calculate the volatility of market sentiment in each period to examine how the market sentiment affects stock price volatility. Finally, column (4) reports the results of a fixed effects estimation in which I control for unobservable management skills and fund characteristics that remain stable over time. I find that my results are not sensitive to controls for these additional sources of stock price volatility, and that the coefficient of *UGL_var* remains above its theoretical level (coeff. estimates range between 1.259 and 1.271). In turn, the coefficient on *RGL_var* is not significantly different from its theoretical value.

- Insert Table 4 about here -

Second, I use an alternative approach to examine whether my results are affected by other factors that are correlated with the volatility of the NAV discount. I start my modeling with the law of one price that sets the stock price equal to the NAV, and the coefficients of model (7) may be biased if the factors that affect the volatility of the NAV discount are correlated with some of the regressors. To control for the omitted variable problem, I divide the sample into fund-years with high volatilities of NAV discounts and fund-years with low volatilities of NAV discounts based on the median split. The influence of correlated omitted variables is likely to be higher in the sample with high NAV discount volatility. This analysis is reported in columns (5) and (6) of Table 6. I find that fair value adjustments lead to excess stock price volatility and that the coefficient estimates on the volatility of the fair value earnings components are very similar

across firm groupings (*UGL_var* coeff. 1.276 for high NAV volatility vs. 1.298 for low NAV volatility). Additionally, I find that the adjusted R^2 in the model with the low volatility of NAV discount is expectedly high (95%), leaving little room for the influence of any omitted variables.

Third, I examine whether an alternative presentation format of fair value adjustments affects the results. I note that funds report unrealized gains/losses as the difference between current-period unrealized gains/losses on investments still remaining in the portfolio and prior-period gains/losses on securities sold during the period. The latter component is reclassified and is reported as part of realized gains/losses. While this disclosure choice is consistent with accounting standards that require the "recycling" of unrealized gains/losses on securities sold during the period, an alternative permitted presentation format is to report only current-period unrealized gains/losses on securities still held and realized gains/losses relative to the most recent valuation of the securities sold during the period. Some funds provide additional footnote disclosures that allow me to estimate unrealized gains/losses and realized gains/losses according to this alternative presentation format. I use model (7) with redefined unrealized gains/losses and realized gains/losses for 137 data points for which data are available. This analysis sheds light on whether alternative presentation formats of fair value adjustments have different implications for excess volatility of stock returns. Column (1) of Table 4 again finds a coefficient on *UGL_var* that exceeds its theoretical value of 1. I conclude that my results are not sensitive to the choice of presentation format of fair value adjustments.

Fourth, I use an alternative dispersion measure of returns and fair value earnings components. The interdecile range is a widely used measure of the volatility, which can shed further light on the volatility in the tails of the returns distribution. I substitute, in model (7), the volatility for the interdecile range estimated for each fund and each 10-year period. I use the interdecile ranges of unrealized gains/losses, realized gains/losses and other income as my

independent variables. The results of this analysis are reported in Table 5. Note that, using interdecile ranges, I can no longer compare the coefficient estimates to their theoretical value of one. Therefore, I compare the coefficient on unrealized gains/losses to the coefficient on realized gains/losses, as in the tests above, to infer the contribution of fair value accounting to stock price volatility. Table 5 reports that the volatility of unrealized gains/losses leads to greater stock price volatility than does the volatility of realized gains/losses (0.655 vs. 0.101, t-stat. 2.27). These results confirm my earlier findings using an alternative volatility measure.

- Insert Table 5 about here -

In summary, I find that markets do not fully incorporate the volatility of fair value measurements into stock prices because stock prices are too volatile relative to the volatility of unrealized fair value earnings. I next shed further light on the reasons for this finding.

7.2 Role of measurement inputs

I exploit the difference in the use of fair value measurement inputs and mixed measurement systems across investment trusts so as to understand whether fair value implementation issues explain investors' response to the volatility of fair value adjustments.

Investment trusts follow U.K. GAAP or IFRS, which require amortized cost accounting for liabilities. I construct a ratio of liabilities to fair-valued assets to capture the extent of the accounting mismatch between the fair value and historical cost measurements, and argue that a greater mismatch will increase the volatility of funds' earnings. Table 6 assesses whether the use of the mixed measurement approach affects earnings volatility. Panel A reports a univariate test based on median splits of the sample into firms that are more and respectively less severely affected by measurement differences (high and respectively low ratios of historical cost to fair value). Consistent with my predictions and the prior literature, I find that the volatility of

unrealized gains/losses is higher when funds report a greater mismatch between fair value and historical cost measurements (0.085 vs. 0.064; t-stat. = 2.80). This result is supported by the regression in Panel B of Table 6 that uses a continuous measure of accounting mismatch and controls for funds' turnover and period fixed effects. Again, I find that the use of mixed measurements leads to a higher volatility unrealized gains/losses (coeff. 0.147; t-stat. = 1.68).

- Insert Table 6 about here -

I next examine whether investors adjust for this excess volatility or whether this excess volatility goes unadjusted and translates into a higher volatility of stock prices. This analysis is reported in Table 7. Table 7 augments model (7) with the proxy for the use of mixed measurements and the interaction terms between this proxy and fair value adjustments. I do not find that investors adjust for the excess earnings volatility induced by the accounting mismatch (coeff. –0.349; t-stat. = 1.30). Thus, I find support for hypothesis 2 and conclude that the use of mixed measurement models is partly responsible for the excess stock price volatility.

- Insert Table 7 about here -

I next turn to the test of hypothesis 3. I use two proxies for the accuracy of fair value measurements. First, I follow Evans et al. (2014) and conjecture that unrealized gains/losses have greater accuracy when they are more predictive about future realized gains/losses.

$$RGL_{it+1} = \beta_0 + \beta_1 UGL_{it} + \beta_2 RGL_{it} + u_{it}, \quad (8)$$

where *RGL* (*UGL*) are realized (unrealized) gains/losses scaled by lagged NAV. The coefficient on current unrealized gains/losses (β_1) indicates the predictive ability of the current fair value adjustments for future realized income. Values of the β_1 coefficient that are closer to 1 indicate greater accuracy of the current valuations in measuring realized income. In turn, I expect the coefficient to be closer to zero if the use of unobservable fair value estimates or the manipulation of underlying market prices by fund managers compromises the accuracy of fair values. I

estimate model (8) for each fund using 10-year rolling windows, similarly to my estimation of the variances in model (7).

Second, I use the exposure of the balance sheet to the use of unobservable fair value inputs (Goncharov et al., 2014). I note that investment trusts hold on average 8.4% of their investments in the shares of unlisted companies and in real estate. While these assets are also carried at fair value, the fair values in this case are derived using unobservable inputs, either by employing the prices of similar assets (level 2 fair value measurements) or using valuation techniques (level 3 fair value measurements). The prior literature shows that there is a measurement risk in level 2 and 3 measurements (Riedl and Serafeim, 2011; Ball et al., 2012). I obtain information on the type of fair value measurement from the footnotes of the financial statements and construct a ratio of unlisted investments to total investments. While my first proxy for fair value accuracy measures the ex-post accuracy of fair value estimates, the percentage of unlisted investments measures the ex-ante accuracy of fair value estimates.

Table 6 shows that the ex-post accuracy of fair value estimates affects the volatility of fair value earnings. Panel A reports that funds with above-median accuracy report a lower volatility of fair value earnings (0.066 vs. 0.083); this result is further supported by the OLS regression of Panel B that uses a continuous measure of fair value accuracy (coeff. –0.066; t-stat. 3.44). However, I do not find that the discretion in the level 2 and 3 estimates affects the earnings volatility (coeff. 0.012; t-stat. = 0.34). One possible interpretation of these mixed results is that the estimates from model (8) provide a superior ex-post proxy for fair value accuracy. Riedl and Serafeim (2011) find that the quality of level 2 estimates is higher than the quality of level 3 estimates, while I cannot differentiate between the two levels in my data. Alternatively, the manipulation of quoted prices in illiquid markets may be a more serious reason for concern in my setting than the use of unobservable fair value estimates.

Turning to the effect of fair value accuracy on stock price volatility, Table 7 reports the results for the interaction between fair value adjustments and the proxy for the ex-post accuracy of fair values. I find that fair value estimates contribute to the volatility of stock prices when their ex-post accuracy is low (coeff. –0.463; t-stat. 2.10). This result supports hypothesis 3. Looking at the economic strength of the relationship, the ex-post accuracy (coeff. β_1 in model (8)) has to increase by 0.775 [= (1.359 – 1)/0.463] to eliminate excess stock price volatility. Table 2 shows that this is a substantial increase, given that the mean (standard deviation) of the ex-post fair value accuracy proxy is 0.201 (0.251). Thus, either investors incorporate information about the accuracy of fair value estimates in their risk assessments only when the quality of fair value estimates is rather "extreme" or there are reasons beyond the accuracy of fair value estimates that explain why fair value accounting increases stock price volatility.

7.3 Investors' processing of accounting information and stock price volatility

Understanding sources of volatility requires the decomposition of volatility into components, and the differentiation between those components that reflect the true underlying risks and those components that capture artificial earnings volatility as documented in Table 6. The prior literature shows that the information in earnings components is fully incorporated into stock prices when shares are traded by sophisticated investors (Lev and Nissim, 2006). I use the percentage of closely held shares from Datastream as a proxy for the presence of institutional investors who are less affected by time constraints and conduct more sophisticated financial analysis. This analysis thus speaks directly to regulators' concern that data collection and processing costs will lead to excess stock price volatility. If some investors do not use the information in earnings components, I expect that the excess stock price volatility will be

concentrated in those investment trusts that are predominantly held by "noise" traders (low institutional ownership).

This analysis is reported in Table 7, which uses model (7) augmented with the variables capturing the share of institutional ownership as well as the interaction term between the ownership share and fair value adjustments. Column (3) reveals that institutional investors significantly reduce the effect of the excess stock price volatility emanating from the unrealized fair value component (coeff. –0.009; t-stat. = 3.51). The estimated coefficient on the interaction term implies that unrealized gains/losses do not increase the stock price volatility (i.e., the estimated coefficient is equal to the theoretical value of one) when the institutional ownership share exceeds 41% [= (1.367 – 1)/0.009].[7] This result supports hypothesis 4.

To examine the robustness of this result, I use the alternative proxy for investors' awareness of earnings components. Financial analysts issue forecasts of disaggregated financial information, which reduces the mispricing of earnings components by making this information more easily available to investors (Mohanram, 2014). I predict that analyst following will mediate the relationship between fair value volatility and stock price volatility. Column (4) of Table 7 reports that analyst following reduces excess stock price volatility (coeff. –0.118; t-stat. = 6.55). This finding is consistent with the view that financial analysts improve the market processing of accounting information by issuing forecasts of disaggregated accounting information. Turning to the magnitude of the coefficient on the interaction term, I find that it takes about two analysts to mitigate excess stock price volatility [2.27 = (1.268 – 1)/0.118].

[7] I also examined whether investment trusts with different institutional ownership shares have varying levels of volatility of unrealized gains/losses (in a similar way to the analyses reported in Table 6). Finding such a relationship would be consistent with the view that investors choose firms based on their inherent volatility/risk. I did not find that ownership type affects the volatility of unrealized fair value adjustments.

Overall, these results suggest that, in an opaque information environment, fair value volatility leads to excess stock price volatility.

8. Conclusion

This study aims to shed new light on how a firm's risk is perceived by the capital markets, based on information conveyed by the volatility of fair value earnings components. While the prior literature shows that earnings volatility is a major covariate of stock price volatility (Beaver and Manegold, 1975), it is unclear whether markets fully incorporate earnings volatility into stock prices. Specifically, academics and practitioners have raised the concern that certain accounting rules can increase the volatility of income and of the stock price above the level that is dictated by the underlying fundamentals. This concern applies to the case of fair value measurements. I use the U.K. investment trust setting, for which the theoretical model dictates equivalence of stock price volatility and volatility of NAV returns. I decompose NAV returns into unrealized and realized fair value gains/losses, and other income, to examine whether the volatility of fair value adjustments is correctly reflected in the volatility of stock prices.

Using data from 155 investment trusts over the period 1991–2013, I find that the stock price volatility is higher than the volatility of the underlying NAV returns, and that this is due to an unrealized earnings component. In turn, the market reaction to realized fair value gains/losses is consistent with theoretical predictions. These results are not sensitive to controls for other risk factors, determinants of the NAV discount, and fund fixed effects. Overall, the results strongly reject the proposition that markets fully incorporate the information contained in the volatility of fair value earnings into stock prices.

I further examine why volatility in fair value adjustments leads to excessive stock price volatility. I show that the use of a mixed measurement system – in which assets are measured at

fair value but related liabilities are measured at amortized cost – predictably increases the volatility of unrealized gains/losses, which in turn translates into a higher volatility of stock prices. I also find that the accuracy of fair value measurements explains the excess stock price volatility emanating from unrealized gains/losses. Furthermore, consistent with the view that institutional investors perform more sophisticated analyses of accounting information, and devote more time to their analysis, I find that the overreaction to the volatility of unrealized gains/losses is attenuated in the subsample of investment trusts with high institutional ownership.

My results suggest that markets fail to correctly respond to the volatility of earnings components. There is an overreaction to the volatility of unrealized fair value adjustments, which explains why the stock prices of investment trusts are more volatile than the returns of their portfolio holdings. These results shed further light on how stock markets process accounting risk measures, and provide a complementary explanation for the excessive volatility of the stock prices of closed-end funds.

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Table 1. Sample selection

Selection criteria	Number of fund-years	Number of funds
Datastream sample of U.K. investment trusts (SIC = 6726)	4,322	594
Non-missing market prices, total assets, net income	3,995	563
10 or more years of available financial statements	3,057	176
Non-missing main test variables	2,471	155
Data available for construction of volatility variables	2,471	155
Constructing volatility variables based on 10-year rolling windows	1,125	
Final sample after deleting outliers	1,059	

Table 1 reports the sample selection procedure for the years 1991–2013. The last two rows of the table report the number of fund-periods used in the tests. Outliers are defined as observations in the 1st and 99th percentiles of the distributions of the main test variables.

Table 2. Descriptive statistics

	Mean	Standard deviation	P25	Median	P75
Ret_var	0.103	0.133	0.039	0.066	0.120
NAV_var	0.093	0.106	0.036	0.059	0.109
FVGL_var	0.099	0.162	0.029	0.049	0.096
UGL_var	0.075	0.121	0.023	0.039	0.081
RGL_var	0.019	0.037	0.004	0.008	0.019
OI_var	0.085	0.187	0.001	0.016	0.084
Cov(UGL;RGL)	0.002	0.033	–0.003	0.001	0.005
Cov(FVGL;OI)	–0.045	0.146	–0.026	–0.003	0.001
Accounting mismatch	0.145	0.115	0.065	0.125	0.189
Accuracy of fv estimates	0.201	0.251	0.079	0.179	0.312
Unlisted investments	0.084	0.225	0.000	0.003	0.027
Closely held shares	15.503	16.744	0.425	11.345	22.745
Analyst following	0.283	2.440	0.000	0.000	0.000

Table 2 reports descriptive statistics for U.K. investment trusts over the period 1991–2013 (N = 1,059). *Ret_var* is the variance of stock market returns. *NAV_var* is the variance of the accounting returns (percentage change in NAV) of fund *i* during period *t*. *FVGL_var* is the variance of the scaled fair value gains and losses of fund *i* during period *t*. *UGL_var* (*RGL_var*) is the variance of the scaled unrealized (realized) fair value gains/losses of fund *i* during period *t*. *OI_var* is the variance of the other income of fund *i* during period *t*. Other income is calculated as the difference between *NAV_ret* and *FVGL*. *Cov(RGL;UGL)* is the covariance between the realized gains/losses and unrealized gains/losses of fund *i* during period *t*. *Cov(FVGL;OI)* is the covariance between the fair value gains/losses and other income of fund *i* during period *t*. *A ccounting mismatch* is the median ratio of the liabilities to the fair value of the investments of fund *i* during period *t*. *Accuracy of fv estimates* is the coefficient on current unrealized gains/losses in the regression of future realized gains/losses on current unrealized and realized gains/losses, estimated for each fund *i* during period *t*. *Unlisted investments* is the median ratio of the unlisted investments to the total investments of fund *i* during period *t*. *Closely held shares* is the median percentage of closely held shares in fund *i* during period *t*. *Analyst following* is the number of analysts following fund *i* during period *t*. Variances, covariances, and medians are estimated over the 10-year rolling window.

Table 3. Stock price volatility and volatility of earnings components

	Predicted value	Fair value gains and other income	*F-test coeff. = predicted value*	Realized and unrealized gains	*F-test coeff. = predicted value*
		(1)	(2)	(3)	(4)
FVGL_var	1	1.256***	5.12**		
		(11.09)			
UGL_var	1			1.267***	7.35***
				(12.87)	
RGL_var	1			0.970***	0.04
				(6.46)	
OI_var	1	0.504*	3.60*	0.488*	4.18**
		(1.93)		(1.95)	
Cov(UGL;RGL)	2			2.913***	9.84***
				(10.01)	
Cov(FVGL;OI)	2	1.619***	1.20	1.609***	1.36
		(4.67)		(4.79)	
Intercept and period FE?		Yes		Yes	
Adj. R^2		76.1%		77.4%	

Table 3 reports the results relating the volatility of market returns to the volatility of fair value earnings components. The sample comprises U.K. investment trusts over the period 1991–2013 (N = 1,059). The table reports the results of the OLS regression using the variance of stock market returns (*Ret_var*) as the dependent variable. *FVGL_var* is the variance of the scaled fair value gains and losses of fund *i* during period *t*. *UGL_var* (*RGL_var*) is the variance of the scaled unrealized (realized) fair value gains/losses of fund *i* during period *t*. *OI_var* is the variance of the other income of fund *i* during period *t*. Other income is the difference between *NAV_ret* and *FVGL*. *Cov(RGL;UGL)* is the covariance between the realized gains/losses and unrealized gains/losses of fund *i* during period *t*. *Cov(FVGL;OI)* is the covariance between the fair value gains/losses and other income of fund *i* during period *t*. Variances and covariances are estimated over the 10-year rolling window. Columns (2) and (4) report the F-test that assesses whether a coefficient estimate is equal to its predicted theoretical value. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively, of the two-tailed tests. *t*-statistics testing whether a coefficient is different from zero are reported in parentheses. All inferences are based on robust standard errors clustered at the firm level.

Table 4: Sensitivity analysis

	Pre-dicted value	Market model	Manager ability and fees	Sentiment	Fund fixed effects	Volatility of NAV discount *Low*	Volatility of NAV discount *High*	Redefining RGL & UGL
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
UGL_var	1	**1.254*****	**1.266*****	**1.263*****	**1.266*****	**1.298*****	**1.276*****	**1.745*****
		(13.89)	(12.95)	(12.90)	(12.94)	(41.82)	(13.02)	(9.50)
RGL_var	1	0.936***	0.978***	0.984***	1.194***	1.158***	0.952***	0.337
		(6.16)	(6.33)	(6.54)	(7.53)	(12.24)	(5.11)	(0.71)
OI_var	1	**0.448***	**0.494***	**0.484***	**0.276**	**1.263*****	**0.408**	**0.499****
		(1.72)	(1.96)	(1.95)	(1.21)	(13.90)	(1.45)	(2.70)
Cov(UGL;RGL)	2	**2.966*****	**2.904*****	**2.923*****	2.359***	**2.718*****	**3.019*****	1.764***
		(10.80)	(9.80)	(10.03)	(9.67)	(26.28)	(9.46)	(4.67)
Cov(FVGL;OI)	2	1.575***	1.613***	1.607***	1.454***	**2.524*****	1.540***	1.237**
		(4.63)	(4.77)	(4.81)	(5.23)	(20.63)	(4.25)	(2.33)
Market_ret	?	0.011						
		(0.29)						
Size	?	–0.009*						
		(1.87)						
NAV_discount	?	–0.015						
		(0.27)						
Fees	?		–0.096					
			(0.31)					
Returns	?		–0.027					
			(0.55)					
Sentiment	?			1.819				
				(0.18)				
Intercept?		Intercept	Intercept & period FE	Intercept	Intercept & period FE	Intercept & period FE	Intercept & period FE	Intercept & period FE
Adj. R^2		77.9%	77.2%	77.3%	75.0%	94.8%	75.3%	83.9%
N		1,059	1,026	1,059	1,059	529	530	137

Table 4 assesses the sensitivity of the main results to alternative model specifications. The sample comprises U.K. investment trusts over the period 1991–2013. All regressions use the variance of stock market returns (*Ret_var*) as the dependent variable. Columns (1)–(3) control for risk proxies, while column (4) uses fund fixed effects to control for unobservables. Columns (5) and (6) split the full sample (N = 1,059) between funds with low and high volatility of the NAV discount based on a median split. The volatility of the NAV discount is defined as the variance of the difference between the stock market returns and NAV returns. Column (7) uses a subsample of funds that disclose the realized gains/losses over the period. This information is used to redefine unrealized and realized gains/losses to capture the unrealized and realized value increments over the last fiscal year. *UGL_var* (*RGL_var*) is the variance of the scaled unrealized (realized) fair value gains/losses of fund *i* during period *t*. *OI_var* is the variance of the other income of fund *i* during period *t*. *Cov(RGL;UGL)* is the covariance between the realized gains/losses and unrealized gains/losses of fund *i* during period *t*. *Cov(FVGL;OI)* is the covariance between the fair value gains/losses and other income of fund *i* during period *t*. *Market_return* is the median equally weighted return of the U.K. stock market during period *t*. *Size* is the median size (log of market equity) of fund *i* during

period *t*. *NAV_discount* is the median log-ratio of the market value of equity to the NAV of fund *i* during period *t*. *Fees* is the median ratio of the management expenses to the NAV of fund *i* during period *t.* *Return* is the median stock return of fund *i* during period *t*. *Sentiment* is the variance of aggregate NAV discounts over period *t*. Variances, covariances, and medians are estimated over the 10-year rolling windows. Coefficients reported in bold are significantly different from their predicted values at the 5% level or higher. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively, of the two-tailed tests. *t*-statistics testing whether a coefficient is different from zero are reported in parentheses. All inferences are based on robust standard errors clustered at the firm level.

Table 5. Alternative volatility measures

	Unrealized gains vs. realized gains	All income components
	(1)	(2)
UGL_idr	0.639***	0.655***
	(4.69)	(4.85)
RGL_idr	0.049	0.101
	(0.33)	(0.70)
OI_idr		–0.049
		(0.64)
Intercept and period FE?	Yes	Yes
Adj. R^2	42.2%	42.6%
t-stat *UGL_idr* = *RGL_idr* [p-value]	2.26 [0.03]	2.27 [0.03]

Table 5 uses alternative dispersion measures of stock market returns and fair value earnings components. The sample comprises U.K. investment trusts over the period 1991–2013 (N=1,059). The table reports the results of the OLS regression using the interdecile range of stock market returns (*Ret_idr*) as the dependent variable. *UGL_idr* (*RGL_idr*) is the interdecile range of the scaled unrealized (realized) fair value gains/losses of fund *i* during period *t*. *OI_idr* is the inderdecile range of the other income of fund *i* during period *t*. The interdecile ranges are estimated over the 10-year rolling windows. The last row of the table reports whether the coefficient on *UGL_idr* is different from the coefficient on *RGL_idr*. ***, **, and * represent significance at the 1%, 5% and 10% levels for the two-tailed tests. *t*-statistics are reported in parentheses and are based on robust standard errors clustered at the firm level.

Table 6: Fair value characteristics and volatility of unrealized gains and losses

Panel A: Univariate volatility analysis

		Volatility of unrealized gains and losses	t-test
Accounting mismatch	High	0.085	2.80***
	Low	0.064	
Accuracy of fv estimates	High	0.066	2.21**
	Low	0.083	
Unlisted investments	High	0.076	0.35
	Low	0.073	

Panel B: Volatility of unrealized gains and losses

	Predicted sign				
		(1)	(2)	(3)	(4)
Accounting mismatch	+	0.147*			0.154*
		(1.68)			(1.73)
Accuracy of fv estimates	−		–0.066***		–0.069***
			(3.44)		(3.79)
Unlisted investments	+			0.012	–0.006
				(0.34)	(0.16)
Turnover	+	0.033*	0.039**	0.034*	0.038**
		(1.87)	(2.23)	(1.87)	(2.38)
Intercept and period FE?		Yes	Yes	Yes	Yes
Adj. R^2		4.5%	4.4%	2.6%	6.3%

Table 6 examines how fair value implementation issues affect the volatility of fair value earnings. The sample comprises U.K. investment trusts over the period 1991–2013 (N = 1,059). Panel A compares the mean volatility of unrealized gains and losses (*UGL_var*) for subsamples based on the median split of *Accounting mismatch*, *Accuracy of fv estimates*, and *Unlisted investments*. Panel B reports OLS regressions using *UGL_var* as the dependent variable. *Accounting mismatch* is the median ratio of the liabilities to the fair value of investments of fund *i* during period *t*. *Accuracy of fv estimates* is the coefficient on current unrealized gains/losses in the regression of future realized gains/losses on current unrealized and realized gains/losses, estimated for each fund *i* during period *t*. *Unlisted investments* is the median ratio of the unlisted investments to the total investments of fund *i* during period *t*. *Turnover* is the median annual turnover of fund *i*'s fair value investments during period *t,* defined as the sum of investment purchases and investment sales divided by the fair value of investments. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively, of the two-tailed tests. *t*-statistics are reported in parentheses and are based on robust standard errors clustered at the firm level.

Table 7. Determinants of excess stock price volatility

	Pred. sign	*Fair value implementation issues*			*Market information processing*	
		(1)	(2)	(3)	(4)	(5)
UGL_var	+	1.341***	1.359***	1.290***	1.367***	1.268***
		(11.82)	(12.17)	(12.10)	(18.34)	(12.80)
UGL_var × *Accounting mismatch*	+/–	–0.349				
		(1.30)				
UGL_var × *Accuracy of fv estimates*	+/–		–0.463**			
			(2.10)			
UGL_var × *Unlisted investments*	+/–			–0.116		
				(0.72)		
UGL_var × *Closely held shares*	+/–				–0.009***	
					(3.51)	
UGL_var × *Analyst following*	+/–					–0.118***
						(6.55)
RGL_var	+	0.998***	1.068***	0.934***	0.870***	0.981***
		(7.07)	(7.60)	(5.99)	(5.07)	(6.57)
OI_var	+	2.864***	2.715***	2.918***	2.577***	2.906***
		(9.92)	(9.75)	(9.81)	(10.03)	(9.94)
Cov(UGL;RGL)	+	0.480*	0.451*	0.485*	0.472*	0.493*
		(1.90)	(1.90)	(1.93)	(1.92)	(1.97)
Cov(FVGL;OI)	+	1.604***	1.594***	1.604***	1.462***	1.615***
		(4.75)	(4.93)	(4.76)	(4.29)	(4.80)
Intercept, main effect of *X* and period FE?		Yes	Yes	Yes	Yes	Yes
Adj. R^2		77.7%	78.0%	77.4%	78.7%	77.9%

Table 7 examines the sources of excess volatility using the variance of stock market returns (*Ret_var*) as the dependent variable. The sample comprises U.K. investment trusts over the period 1991–2013 (N = 1,059). *UGL_var* (*RGL_var*) is the variance of the scaled unrealized (realized) fair value gains/losses of fund *i* during period *t*. *OI_var* is the variance of the other income of fund *i* during period *t*. *Cov(RGL;UGL)* is the covariance between the realized gains/losses and unrealized gains/losses of fund *i* during period *t*. *Cov(FVGL;OI)* is the covariance between the fair value gains/losses and other income of fund *i* during period *t*.

Variances and covariances are estimated over the 10-year rolling window. *Accounting mismatch* is the median ratio of the liabilities to the fair value of investments of fund *i* during period *t*. *Unlisted investments* is the median ratio of the unlisted investments to total investments of fund *i* during period *t*. *Accuracy of fv estimates* is the coefficient on current unrealized gains/losses in the regression of future realized gains/losses on current unrealized and realized gains/losses, estimated for each fund *i* during period *t*. *Closely held shares* is the median percentage of closely held shares in fund *i* during period *t*. *Analyst following* is the total number of analysts following fund *i* during period *t*. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively, of the two-tailed tests. *t*-statistics are reported in parentheses and are based on robust standard errors clustered at the firm level.