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Hedging Media Sales Cash Flow At Otavamedia - A Risk Management Method For Closely Held Companies

Finance

Master's thesis

Joonas Reenpää

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Department of Finance
Aalto University
School of Business

Aalto University
School of Business

Aalto University, P.O. BOX 11000, 00076 AALTO
www.aalto.fi

Abstract of master's thesis

Author Joonas Reenpää

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Objectives of the thesis

The objective of this thesis is to discover whether Otavamedia, a Finnish media company, can utilize its' publicly listed competitors' shares as a tool of risk management for its media sales cash flow. The risk associated with media sales cash flow is the inevitable effect it has on shareholders' funds available for distribution. The advantage the company has is the advance knowledge of media advertising growth, which is generally found to be vastly cyclical and volatile. This information would by the assumptions of this paper, provide the company with a predictor on the future growth of its competing companies' share prices. The study proposes that a combination of securities could then be found which would offset a significant amount of Otavamedia's media sales cash flow volatility and deliver additional cash flows. The testing process was designed so that it would not be overly focused, but rather a wide set of parameters were included to broaden the scope of the study. Different portfolio variations, adjustment intervals, hedging strategies, regression models, and data lag times are all cross-inspected to find out which combinations provide best outcomes.

Data

The data consists of internal media sales cash flow figures of Otavamedia, its competitors share price data, the main Finnish market indexes, and three control variables. The monthly media sales cash flows are from January 1998 through December 2012, and all other data are retrieved for the same period. Apart from the media sales cash flow, the data is daily, but due to the dependent variable being on a monthly level, the timeframe inspected in the study is explicitly monthly.

Main findings

The main findings of the thesis are that indeed Otavamedia can partly lower its risk to media sales cash flow volatility by constructing the proposed risk management mechanisms. Both lowered volatility and improved cash flows are reported, but their economic significance to the case company remains questionable. The suggested alternate strategies on hedging were not found beneficial, but rather that the simple and straightforward hedging method proved best results.

Keywords risk management, hedging, private company, family company

Aalto-yliopisto
Kauppakorkeakoulu

Aalto-yliopisto, PL 11000, 00076 AALTO
www.aalto.fi

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Tutkielman tavoitteet

Tämän tutkielman tavoitteena on selvittää, mikäli suomalaisen mediayhtiön, Otavamedian, on mahdollista hallita mainosmyynnin kassavirran vaihtelun riskiä. Kyseinen riski tarkoittaa heikentyvää kassavirtaa, ja sen vääjäämätöntä vaikutusta omistajien käytettävissä olevaan tilikauden voittoon. Tutkielmassa esitellään uusi menetelmä yksityisen yrityksen riskienhallintaan, jossa kyseisen yhtiön pörssinoteerattujen kilpailijoiden osakkeita pyritään käyttämään hyödyksi yhdessä yleisen pörssi-indeksin kanssa. Tavoitteena on löytää sellainen yhdistelmä lyhyitä ja pitkiä positioita, joiden nettovaikutus olisi positiivinen kassavirta kuukausitasolla. Kunkin yksittäisen arvopaperin suojauskertoimet arvioidaan käyttäen tilastollisia menetelmiä, perustuen niiden yhteyteen Otavamedian mainosmyynnin kassavirran kanssa. Lähtökohtana on siis se, että Otavamedian mainosmyynnin ajatellaan voivan ennustaa sen julkisten kilpailijoiden pörssikursseja, sillä myös mainosmyynnillä on suuri vaikutus myös heidän taloudelliseen menestymiseen.

Aineisto

Tutkielman aineistona käytetään Otavamedian sisäisiä mainosmyynnin euromääräisiä lukuja vuodesta 1998 aina joulukuuhun 2012, kilpailevien mediayhtiöiden pörssikursseja, sekä Helsingin pörssin yleisindeksejä. Lisäksi ulkoisia vaikutuksia pyritään hallitsemaan 12 kuukauden Euriborilla, kuluttajaindeksillä, sekä paperimassan kansainvälisellä hinnalla. Tiedot ovat muutoin päivätasolla, mutta mediamyynnin eurot on saatavilla ainoastaan kuukausitasolla. Näin ollen tutkielmassa käytetään kaikilta osin kuukausitason lukuja.

Tulokset

Tutkielman tuloksena voidaan todeta, että Otavamedian on jossain määrin mahdollista hallita mainosmyynnin kassavirran vaihtelua sen julkisten kilpailijoiden pörssikursseja hyödyntäen. Lisäksi myös yrityksen kassavirtaa on mahdollista parantaa mediamyynnin tilauskirjan ennustuksen mukaisesti. Suojauksen räätälöiminen paremmin ennakkotietoa hyödyntäväksi ei ole kannattavaa, vaan parhaat tulokset saatiin yksinkertaisella suojauksella, joka on aktiivinen koko tutkitun ajanjakson ajan.

Avainsanat riskienhallinta, suojaus, yksityinen yritys, perheyritys

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1. Introduction

This study aims to discover whether Otavamedia, a Finnish media company, can take action to reduce its vulnerability to the decline of media sales cash flow. The proposed risk management method requires substantial capital and resources, and thus a thorough, scientific inspection of the probable outcomes and their implications are required. Risk management in general is an interesting topic in finance with direct applicability to industries and companies around the world, and is widely recognized as one of the most important financial activities of a company. A company's performance varies as a result of uncertainties in the economic, political, social and competitive environment in which it operates. Risk management activities aim to lower the effect of these uncertain events on a company, in other words the aim is to lower uncertainty. Commonly this reduction of variation in the value of a spot position is achieved through a contrary position on a futures contract or another financial derivatives product, or by agreeing on set prices for a longer term.

Risk management can be divided into two categories, hedging and speculation. Hedging aims to decrease a certain uncertainty, where as speculative endeavors intend to capitalize on the exact same uncertainty. Typical risks to build either hedges or speculative positions on include interest rate risk, foreign exchange risk, commodity price risk, credit risk, equity risk and liquidity risk. Hedging is intended to reduce cash flow volatility where as speculation aims to increase it. Contracts to undertake risk management efforts, commonly known as derivatives, have for example such names as forward rate agreements, repurchase agreements, futures, options and swaps. These instruments will not be under review in this thesis, as the purpose is to provide an alternative risk management tool for industries which these financial products do not cater to.

Both hedging and speculation can be practiced on and off the company's balance sheet. On the balance sheet practices refer to acquiring either a cash flow or an asset that will rise or fall in value to offset or increase the value of a an existing position. Off the balance sheet the same practices can be thought of as contracts that have the same result without having to acquire the assets. Financial companies, that are often the market makers in derivative instruments, can be expected to hold offsetting positions to segregate themselves from the uncertainty. Their business is to profit on the fees generated through transaction activity and

not to speculate on probabilities. The motivation for non-financial firms however, is to offset a position they already have on their balance sheet, and thus their position can be expected to be one-sided.

If there were no costs or other barriers associated to setting up a risk management program, all existing companies could be assumed to undertake some degree of risk management in order to expose themselves to only the specific risks they best understand. Empirical literature on derivatives usage commonly assumes that firms use them solely for the purpose of hedging (Faulkender (2005)). However, both speculation and lower cost of capital (interest rate derivatives) are also viable purposes of derivatives use, and thus no general presumptions about hedging motives should be made. It can be also questioned whether existing literature on the topic assumes that firms that do not use derivatives are not hedging at all, as the use of derivatives is commonly associated with hedging. In business fields where there are currently no derivative instruments available, similar effects to those offered by derivatives can be obtained via for example long-term contracts. Fixing the price of a raw material is equivalent to being exposed to a floating price and then protecting the exposure with a swap. In the end the buyer ends up paying slightly more than the current floating price, but in return is not as subject to its changes in the near term.

This rest of the introduction section is organized as follows. The motivation for the study is presented next, followed by the papers' contribution to existing literature. The research questions and the limitations of the study are summarized briefly, after which the data and methodology are examined. Lastly the introduction section includes the main findings of the paper and familiarizes the reader with the structure of the study.

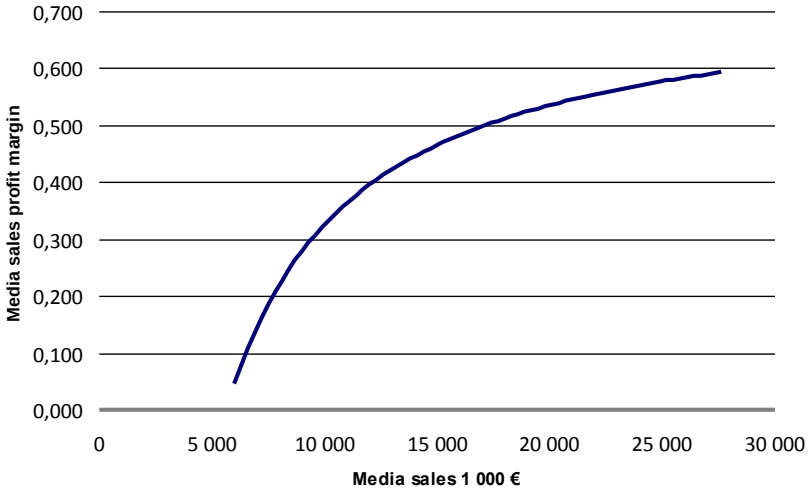
1.1 Motivation for the study

Otavamedia is a Finnish media company which publishes customer magazines and periodicals in Finland and Estonia. Its online services constitute NettiX, a provider of online marketplaces, the internet portal Plaza, webcast producer DeCo Media, sports website Golfpiste.com., and news aggregator Ampparit.com. Revenue for the year 2012 totaled 154 million and the number of employees was 485.

The company's revenue streams can be seen as relatively steady, as the majority of Finnish magazine subscribers are long-term customers and most of them pay their subscriptions fully in advance. Contracts in the customer communication market are also made for at least 12 months at a time. The single reported risk management effort the company undertakes currently is signing long-term agreements to hedge fluctuating paper prices. Printing and distribution contracts are also signed on an annual basis. In the 2012 annual report the company's operational risks are stated to be small, which stems from the significance of steady cash flow streams on operational continuity. Even though the fluctuating nature of media sales is recognized as a significant external factor, its volatility is set aside on the basis of its minor share of net sales, with no regard to its relevance in company profitability. Other relevant risk management projects could have been related to foreign operations, currency and interest rate exposure, but Otavamedia's transaction and translation exposures are negligible as it has no significant operations abroad. Also, the advertiser-customers of the company are local operators and pay in local currency. Interest expenses are not noteworthy or significant in any matter as the company and its parent are nearly debt free.

In 2012 Otavamedia's media sales amounted to 17,5 m€ which is a mere 12 % of total sales, but surprisingly this 12 % of revenue generated nearly half of the company's earnings. The profit margins of the company's other products are significantly lower, which draws attention to the importance of stable media sales cash flow on company performance. Figure 1 displays the critical link between media sales volume and its profitability. The present sales volume results in a roughly 50 % profit margin, but both positive and negative changes in sales volumes have a drastic effect on profitability.

Figure 1. Media sales' profit margin increases significantly with cash flow volume
The data is based on calculations of the current state of fixed and variable costs. Fixed costs total 4,2 m€ and variable costs total 25,5 % of sales.



The costs related to media sales consist of both fixed and variable costs. Fixed costs include marketing, research and administrative costs, while variable costs are related to inserts, printing and shipping. Due to the cost structure, the profitability of media sales increases progressively with cash flow. In 2012, with roughly a 50 % profit margin, media sales contributed nearly half of the company's total profits. Through its high profitability, media sales cash flow volatility is actually a much higher risk than is currently acknowledged within the company. A 10 % change in media sales (ceteris paribus) would result in a 15 % change in profits generated through media sales, which would lower or increase the company's total profits by 7.6 %. Thus the relation between total profits and media sales cash flow at the current media sales volume is that a 1 % change in media sales cash flow results in a change of approximately 0.76 % in total profits attained. The linearity of profits generated through the stream of media sales cash flow hints of the possibility of creating a hedge (Mackay and Möller (2007)).

In his MBA thesis Törmä (2009), who is also an editor-in-chief at Otavamedia, concludes that Finnish magazines' media sales are highly dependable on the general economy (i.e. changes in GDP), and are therefore predictable based on macroeconomic indicators. If the state of the general economy explains media sales volumes to a high degree, it is then expectable that there exist clear correlations between the sales trends of competing Finnish media companies. Companies that have more products based on advertising cash flow should have higher exposure to media sales volatility, meaning that their profits are even more dependent on its changes.

According to the director of media sales at Otavamedia, the advertisement order book can accurately project sales volumes a month in advance. It is questionable whether this information can predict the Finnish media sales industry in general, but should there be significant correlations between the media sales of competing media companies, it could provide foresight into the sales volumes of all of them prior to the information being public. The way Otavamedia could benefit from knowledge of competitors' future cash flows, is by assuming equity positions in them prior to their quarterly reports. As the company in question is a private enterprise, the possibility of having short positions in competitors' shares is not unthinkable, as the company is not required to disclose such balance sheet details. The ethics of the activity may be questioned, but at the same time it could in fact offer a solution to diminish the effect of the high volatility in media sales cash flow.

Currently there are no derivative instruments directly related to advertising cash flows available, let alone the Finnish media industry specifically. During 2010 a Chicago-based company called Media Derivatives Inc. applied to begin trading contracts tied to box office receipts on the first weekend of a movie's release in wide distribution, in other words betting on the immediate popularity of a new motion picture. Cantor Exchange had similar plans, but both were brought down by the July 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act. Even if these endeavors failed, this could be a hint of awoken appetite for a more diverse range of risk management instruments, as these contracts would in effect allow movie producers to lower uncertainty. Success in one industry could easily lead to extending the business model to other areas.

In this thesis I will discover whether it is possible to use a combination of long and short positions in Finnish media equities and the Finnish stock market index in order to hedge Otavamedia's media sales volatility and earn additional cash flows over media sales. The hedging capability of the portfolios will be tested on various lag times to account for different assumptions on information asymmetry convergence, i.e. the delay for changes in media sales cash flow to be reflected in media companies' share prices. Also, in addition to a regular hedging strategy, two alternate approaches will be inspected: one where the hedge is only active for time periods of negative media sales cash flow growth, and a strategy where the position is swapped into a speculative one when internal order books indicate a rise in media sales cash flow. This thought stems from Bailly et al. (2003) findings of companies altering their hedging decisions based on their opinion of the future. They find that the objective behind modifying positions might, instead of boosting yields, be to avoid hedging against what they consider as a less-likely scenario.

1.2 Contribution to existing literature

The hedging methods readily available to companies can be divided into categories with respect to the underlying risks they aim to reduce. Interest rate risks, currency risks, commodity price risks, credit risk and such, are all recognized as standard subjects of hedging. There are many other risks firms are subject to that might not be considered preferable business risks, i.e. the risks the company wishes to have because they are a part of

the business or industry it operates in. This paper aims to uncover a new method for private companies to control their risks. If viable, the method could be of significant use to potentially any company with publicly listed competitors that have similar cash flow streams and are subject to the same, strong external influence.

The main addition to existing literature is the better utilization of information asymmetry advantages. How to better benefit from being aware of something in advance that the firms' public competitors are also subject to, but have not announced yet. The single existing study on a similar method by Strong (1991) investigated the opportunities of an oil price risk hedge based on a portfolio of oil production companies, and found no significant results for the hedging endeavors. His study failed to acknowledge the highly probable inherent risk management activity in the oil industry itself, which would naturally affect the portfolio's volatility reduction in oil price.

A key difference between private and public companies is regulation. A privately held firm is less regulated and restricted in comparison to its public competitor. Its financial reporting may be annual instead of quarterly, and it does not have to disclose the details of its balance sheet. With less transparency, there is also less monitoring of the company's operations. While it might be considered unethical or explicitly forbidden for a public company to be short its competitor's shares, a private company does not have such constraints.

The research on private, family-owned businesses is quite rightly dwarfed by the research on publicly listed corporations, much due to the amount of information available and the size of the companies. My paper will bring insight into the risk management options a private company might have that most public corporations are unable to benefit from due to regulatory or ethical reasons. Any significant results could later be tested on other industries with similar cash flow and risk characteristics.

1.3 Research questions and limitations

This paper focuses on determining whether privately held companies can utilize the common shares of public companies with shared business risks in managing their own business risk and maintaining or increasing the level cash flow. The uncontrollable nature of the inherent

risk associated with media sales is the underlying assumption of the key research questions, which are as follows: can having exposure to competing media companies share prices have a volatility reducing effect on cash flow? And can this effect at the same time provide excess cash flow at an annual level? Additional questions include whether the exposure is more effective when information asymmetry is better utilized by activating the hedge only at times of negative expected cash flow growth, and whether it can be made even further effective by swapping the exposure at times of positive expected cash flow growth.

The main limitations of the study lie with the small sample of public media companies available in Finland. These companies are the logical benchmark as they are affected by the same media sales cash flow shared by the media industry. Due to the data comprising only three separate companies, the foremost concern is whether results are limited by outliers in these data points. A larger sample of companies would provide a healthier base for inspection, but problems might arise from spurious regression – the false interpretation that variables with no direct causal connection are correlated.

1.4 Data and methods

The list of potential companies to be used in the study is quite limited: only three companies can be realistically expected to share the same risk characteristics with Otavamedia. This will undoubtedly result in a narrow spectrum of outcomes, but nevertheless some indication on the viability of the method can be observed. While share price data is available daily, the shortest timeframe offered by Otavamedia's media sales cash flow is monthly. Tormä's 2009 finding that annual media sales volumes and the general economy are strongly correlated lends support to the thought that annual cash flow values are not specific enough to build hedge positions on. In addition, advertising spending is irregularly divided between months, and large differences exist for example between the spring- and summer months. For these reasons all tests will be ran on monthly data.

The data consists of the following four components: Otavamedia's monthly internal media sales cash flow figures, a benchmark of Finnish advertising volumes by advertisement category, competitor's share price and stock exchange index performance, and the control variables. Global and European media companies were examined, but quickly found to have

quite unrelated trends with the Finnish market. The plentiful and cost-efficient exchange-traded funds would provide a tempting sample size.

The media sales benchmark provided by TNS Gallup Oy is mainly utilized to witness the relevance of such a benchmark on a) Otavamedia's media sales cash flow and b) competing media companies' share price performance. The public Finnish media companies are Sanoma Corporation, Alma Media, and Talentum. Two Finnish indexes are used to counter the market properties of said media companies, the OMXH and the OMXH25. The control variables included in the study are the 12 month Euribor rate, the Finnish consumer price index KHI (1995=100), and the global wood pulp price index.

The sensitivity of each individual security to both the media sales cash flow of Otavamedia and the Finnish media sales benchmark is obtained by performing ordinary least squares regression on the monthly price change of the security on the percentage change of media sales cash flow. Different lag periods will be utilized to determine the real delay before media sales levels are reflected in share prices, in other words the highest correlations. A multiple OLS regression is used to estimate the exposure of the securities to both the Finnish stock market index and media sales cash flow. The price changes on individual securities are expressed as a linear function of the monthly return on the Finnish market index OMX25 and the monthly percentage change in Otavamedia's media sales cash flow. These tests aim at revealing the relevance of media sales cash flow as a predictor to said public companies' share prices.

Four different hedge portfolio consistencies are constructed by using OLS and vector error correcting regression models to derive each individual security's correct hedge ratio. The four tested portfolio compositions are: a single short position, a short position coupled with a long market position, and portfolios consisting of two or three short positions and a long market position. The portfolios are tested for three different adjustment intervals: a constant portfolio which is not altered at all, a monthly adjusted portfolio, and a quarterly adjusted portfolio. This is done in order to determine the benefit of readjusting the hedge positions in line with current levels of media sales cash flow, thus returning the hedge ratios back to mean.

In the case that the results for continuous hedging appear unsatisfactory, a test for partial applicability is in order. Specific periods of time when the media sales cash flow changes dramatically are selected for individual inspection.

1.5 Main findings

The results of the study fell short of expectations, but at the same time gave promise to the concept of such a hedging method. The hypotheses of the study were only partially confirmed, by the fact that some of the inspected media companies' share returns are indeed significantly correlated with Otavamedia's media sales cash flow (H1), and that the suggested hedge portfolios did to some extent offer annual increases in cash flow (H2). However, the further proposed, more tailored hedging strategies proved to be less beneficial, and thus both the third and fourth hypotheses were rejected. Activating the hedge only for time periods of negative sales growth was not found effective (H3), and neither was the strategy of reversing the position for positive sales growth time periods (H4).

The highest annual cash flow increase over the study period was found with the OLS derived portfolio consisting of three short positions and a long market position – an annual cash flow effect of 1.32 % or 273 156 Euros. For specific years of media market turmoil, the hedging strategies did provide improved results. For two of the years reviewed, the annual cash flow premium exceeded 2 % and for 2008 it reached the maximum of 4.58 % in the study. These figures are grand in comparison to the average cash flow effects of less than 1 % from the whole period under review, but remain modest when evaluated with regard to the annual declines in media sales cash flow during those same years.

1.6 Structure of the study

The rest of the thesis is structured as follows. Section 2 takes a look at previous literature on a number of subjects related to risk management and the topic under review. Section 3 proposes the hypotheses of the thesis. Section 4 describes the data and methods of the study. Section 5 presents the results. Section 6 offers the conclusions of the paper and discusses the interpretation of the conclusions.

2. Literature review

Most empirical studies on risk management focus on the relation between corporate hedging and firm characteristics, and try to determine whether the behavior of firms that hedge is consistent with extant theories. However, the empirical evidence does not support any single theory (Jin and Jorion (2006)). This section of the thesis takes a look at the existing literature around the subject. Certain discretion is necessary as a relevant connection can easily be seen with a large number of research areas, and not all can be included. The selected research is divided into six topics, presented in sections 2.1 through 2.6.

2.1 Modigliani and Miller

In 1958 Modigliani and Miller presented a paper leading to what is now known as the Modigliani-Miller theorem or the capital structure irrelevance principle. Under the assumptions of perfect capital markets, they argued that it makes no difference how a company is financed; leverage ratios and dividend policies do not contribute to the value a company has. The theorem states that the sole objective of a company is to maximize its current market value with no regard to its probability of bankruptcy, the survival of an individual company is not considered meaningful in the entirety of all existing companies, and therefore risk management efforts are irrelevant. Under the assumptions of perfect capital markets, a firm's sole objective is to maximize its market value, which is independent of financing. A company's market value is indeed a common metric of success. However, for the owners of companies that may not always be the case. Gordon (1985) finds that maximizing current market value serves those shareholders who hold well-diversified portfolios and are thus less subject to the risk of an individual company's bankruptcy. Regardless of individual shareholders' diversification efforts, firm-level risk management is not necessarily the sole solution. In some industries the hedging activities of the company could realistically be replicated by the shareholders themselves. An investor could identify the price exposure of a firm from its financial reports and hedge it herself. This situation would be closer to the M&M assumptions and no risk management would be required from the company.

Other studies point to risk management being a contributor to enterprise value. Smith and Stulz (1985) examined hedging practices among large widely-held corporations and found that a value-maximizing firm can hedge for three reasons: (1) taxes, (2) costs of financial distress, and (3) managerial risk aversion.

2.2 Wealth transfer effects between stockholders and bondholders

Conflicting with the Modigliani-Miller theorem, studies relevant to risk management have been carried out on the topic of capital structure. The capital structure of a company is not important according to the Modigliani-Miller theorem, but the effect it has on cash flow is unmistakable. Generally speaking, firms can reduce the volatility of their cash flows by matching the interest rate exposures of their liabilities to that of their assets. The expected interest payments are thus closer to the amounts received as interest on assets, and therefore their net difference is smaller (Smith and Stulz (1985)).

Originating from the assumptions of the MM theorem, for example Jensen and Meckling (1976) and Myers (1977) have found that owners of leveraged firms can have incentives to increase the firms' riskiness to transfer wealth from bond holders to stock holders. This in effect means that the owners of a company would prefer to have higher firm-level risk and handle risk management activities themselves. In this case the company's bondholders would suffer as the repayment of their loans would be more uncertain.

2.3 Agency theory

Agency theory argues that, because managers are typically not full residual claimants or in other words shareholders, they make decisions lead to personal benefit while potentially decreasing the value of the firm. For example experience in running a more complex organization can increase the labour market's perception of the manager's ability. It can also be quite valuable in terms of social status for a manager to say that she runs a more complex organization. The said complexity of one's position can similarly be expected to have direct impact on the managers' personal compensation. Risk management and diversification strategies are generally seen as poor corporate governance alternatives because they offer opportunities for managerial entrenchment and private benefit (Leland (1998)). Leland (1998)

also finds that hedging can increase a firms' debt capacity, therefore generating greater tax advantages from greater leverage. In order to mitigate agency costs, diversified firms should by this regard employ more specific corporate governance mechanisms, as diversification decisions can be related to the agency problems between shareholders and managers.

A 1995 study by May finds that the private preferences of managers seem to affect corporate risk management, which is rather logical when a managing director's compensation often includes a payment whose value depends on company earnings performance under a specific period of time. It follows that the manager's expected utility depends on both the firm's market value and its profitability. If the manager's anticipated compensation depends heavily on earnings and is a concave function of earnings, one would expect the manager to be inclined to principally hedge the firm's earnings even if doing so increases the variance of the firm's economic value. If the manager has a significant personal stake in the company, one would increasingly expect the firm to hedge, as the manager's end-of-year wealth is even more a linear function of the value of the firm. Given the practical limitations of the managers eliminating the risk on their own accounts, it appears as if they manage their firms so as to moderate these risks at the corporate level. Managing a more diversified firm can enable managers to derive private benefits (Jensen (1986), Stulz (1990)) which may come from a variety of sources, such as prestige or better career prospects associated with running a more diversified firm. Private benefits may also arise because running a more diversified firm increases its managers' pay, their opportunities for skimming or because it entrenches them, making them more valuable to the company. In his 1996 study of gold mining firms' hedging activities, Tufano finds strong evidence in support of the managerial risk-aversion theory, according to which managers who hold more stock tend to undertake more hedging activities. The shareholders of a company essentially choose the management's compensation package by accepting it in the company's Annual General Meeting, and thereby have direct influence on the company's hedging activities.

In family firms however, studies have suggested the limited applicability of agency theory (Tsai et al. 2006; Anderson and Reeb 2003a). The problems underlined by agency theory are also found to be less severe in family firms because there is less likelihood of information asymmetry problems. In addition, family firm CEOs are potentially influenced by higher-order cognitive-related motives such as altruism and collectivism. Managers with large, undiversified positions face higher idiosyncratic risk from incentives and therefore diversify

their firms more to lower that risk (Aggarwal and Samwick 2003; May 1995). The undiversified character of shareholding may provide sufficient incentive to reduce firm risk. Unlike typical open market investors, founding families may be unable to adjust their portfolios, but at the same time can have more influence over the firm's investment decisions. Closely-held firms have undoubted incentives to hedge, since the owners have more focused portfolios and, thus, have distinct benefits if managers reduce the variance of the firm's economic value. Naturally it follows that in addition to off balance sheet hedging, risk averse controlling families have incentives to pursue projects with imperfectly correlated cash flows relative to existing projects (Anderson and Reeb 2003b). These results are contradicted by the findings of Denis et al. (1997) that higher equity ownership offsets the private benefits managers derive from diversifying. However, later in 2003 Aggarwal et al. show that the negative relationship between manager incentives and diversification found in Denis et al. (1997) and Anderson et al. (2000) is explained by unobserved, firm-specific factors. Those factors controlled for by firm-level fixed effects, their study on top five S&P 500, S&P MidCap 400, and S&P SmallCap 600 companies executives ranked by total compensation from 1993 to 1998, finds that changes in incentives and diversification are due to changes in the private benefits associated with diversification. This result is consistent with May's (1995) conclusion.

There exists no academic consensus on the optimal method of pay-for-performance through stock or option grants to align the management's risk management objectives with those of outside shareholders. Nance, Smith, and Smithson's (1993) carried out a survey on 194 fortune 500 and S&P 400 companies, determining their incentives for using off-balance sheet instruments for managing risk, i.e. hedging. They found that risk aversion provides an unsatisfactory explanation for the observed volume of trading activity, as the market is dominated by corporations and institutions and not by individuals. Their conclusion nevertheless is that firms hedge to reduce expected tax liabilities, to lower expected transactions costs, and to control agency problems.

2.4 Modern portfolio theory

Risk in itself can also be defined statistically, as the sum of all outcomes times their probabilities. Modern portfolio theory defines risk as the standard deviation of return, and

models a portfolio as a weighted combination of assets so that the return of a portfolio is the weighted product of the individual assets' returns. It assumes that the assets' returns are distributed normally (Gaussian bell curve), and therefore the fluctuations to either side from the middle have equal probabilities. It also assumes that investors are rational and that markets are efficient.

MPT aims to lower the total variance of portfolio return, by matching up assets that have differing return characteristics, i.e. they cannot all move uniformly in the same direction, but rather they should cancel out a portion of each another's fluctuation. The aim is that by selecting a collection of investment assets they collectively have lower risk than any of the assets on their own. By this regard, it should be possible to find common shares of publicly listed companies whose underlying risks cause their returns to complement each other in this manner. The instruments could theoretically be used as parts of a portfolio which would hedge the risks of a private company's with similar risk characteristics. However, there is little empirical analysis on the effectiveness of using equity share portfolios to manage risk in the aforementioned method. Prior research has examined the ability of equity portfolios to hedge commodity price inflation, with mixed results. Gay and Manaster (1982) found that equity investments were unable to hedge against consumer price inflation over the 1966-1979 period. In contrast, Bernard and Frecka (1987) show that holding portfolios of common stocks was successful in reducing the risk of unexpected inflation in the cost of food, transportation, and shelter over the 1969-1982 period. Mixed results were found by Herbst (1984) and by Schipper and Thompson (1981). Then again, Strong (1991) attempted to manage oil price movement risk by constructing a portfolio of publicly listed oil companies' and using the portfolio as a hedge.

The popularity of the modern portfolio theory is naturally mirrored by criticism. Many theoretical and practical instances have been brought up since its inception. For example the fact that financial returns do not follow a Gaussian distribution and that correlation between asset classes is not fixed but can vary depending on external events. Further, new research topics such as behavioural finance stem from the growing evidence that investors are not rational and markets are not efficient.

2.5 Incentives to risk management

Another interesting topic is the motivation behind risk management activities. What reasons do companies tend to have to either accumulate or lower their risks? Stulz (1984), Smith and Stulz (1985), DeMarzo and Duffie (1991), among others, construct models of corporate hedging. These models observe that firms attempt to reduce the risks they face if they have poorly diversified and risk-averse owners, face progressive taxes, suffer large costs from potential bankruptcy, or have funding needs for future investment projects in the face of strongly asymmetric information. Increasing risks however, has more to do with speculating and being strategically exposed to a specific risk factor.

The capital asset pricing model (CAPM) suggests that a corporation should not undertake any risk management efforts at all, as its shareholders are free to own other firms and assets to diversify the underlying risks accordingly to their own preferences. However, to owners of private, closely held enterprises, the riskiness of one individual firm can be more significant. For example Eckl and Robinson (1990) argue that the principles set forth by the capital asset pricing model suggest that hedging would only make sense for owner-managed firms whose owners do not hold well-diversified portfolios. Mayers and Smith (1990) include closely held common stock companies in their study of reinsurance purchases by 1276 property-casualty insurance companies and find that in the case of ill-diversified investors, risk aversion provides an additional incentive for hedging. In this regard the findings of Nance, Smith and Smithson (1993) are aligned with Eckl and Robinson and Mayers and Smith. They find proof that closely held companies hedge more than do companies with more diverse ownership.

It appears there is evidence in support of risk management incentives being linked to a company's capital structure, and particularly their tolerance to risk. The following sections take a closer look at different incentives that influence risk management decisions.

2.5.1 Risk management as a signal of managerial skill

An alternative managerial explanation is advanced by Breeden and Viswanathan (1996) and DeMarzo and Duffie (1995), who focus on managers' reputations. In these models, outsiders cannot observe managerial quality, nor can they disentangle profits due to managerial quality

as compared to exogenous market stocks. As a result, managers may prefer to engage in risk management so as to better communicate their skills to the market. This is linked to the incentives presented with agency theory – a manager can be inclined to establish a more complex enterprise to epitomize her own competence. A shortfall of these models where managers use hedging to signal their abilities is that they presume that investors cannot separate results attributable to risk management from those attributable to ability. Perhaps this difficulty for outsiders to determine the direct results of management activities may be furthered by the managers themselves.

2.5.2 Managing expected financial distress costs

A risk common to all business enterprises in general is financial distress, which can lead to bankruptcy and reorganization or liquidation, situations in which the firm faces direct legal costs. Mayers and Smith argue in their 1982 paper that hedging reduces the probability that the firm encounters financial distress by reducing the variance of the firm value, and thereby reduce the expected costs of financial distress. Similarly Dolde (1995) and Haushalter (2000) report a positive and significant relation between hedging and leverage, consistent with the theory that hedging helps reduce financial distress.

While for smaller companies these costs may be significant, for a large company they may only be a small fraction of its net assets. Nevertheless, even small financial distress costs can be sufficient to induce large firms to hedge, if the reduction in expected costs exceeds the cost of hedging (Smith and Stulz (1985)). Warner (1977) states that all other factors unaccounted for, smaller firms should hedge more because of the inverse relation between firm size and bankruptcy costs.

For closely held private enterprises the risk of financial distress may have even higher significance. As mentioned before, the individual shareholders' assets are commonly biased towards the said company, and therefore the ownership stake is of higher importance. Along the lines of this logic, Casson (1999) underlines firm survival as a key concern for families, suggesting they are potentially long-term value maximization advocates. Further on, Tsai et al. (2009) find that founding families favour risk-reducing decisions in order to maintain family wealth and prestige – they are more interested in survival than growth. In another

study on the case of family enterprises, Anderson and Reeb (2003a) argue in their comparison of family and non-family firms in the S&P 500 that it is less common for the owners to have diversified portfolios, as the ownership stakes are generally inherited and thus hold additional emotional value based on kinship. Anderson and Reeb (2003b) also suggest that controlling families can be risk averse due to their ill-diversified portfolios, and thus prefer to pursue projects with imperfectly correlated cash flow relative to existing projects. This can be regarded as on-balance-sheet hedging, i.e. diversification within the company.

2.5.3 Company size influences risk management activities

Company size is another research field relevant to the topic of risk management - size itself logically means fewer resources and lower economies of scale. Continuing from the assumptions of modern portfolio theory, for speculation to be a profit-making activity in rational markets, either a firm must have an information advantage related to the prices of the instruments underlying the derivatives, or it must have economies of scale in transactions costs allowing for profitable arbitrage opportunities (Géczy et al. (1997)). In their paper titled *Corporate financial hedging with proprietary information* (1991) DeMarzo and Duffie find that a company's shareholders can actually benefit from hedging when the managers of the company have more and better information about plausible risks that can affect the firm's performance. Géczy et al. (1997) add by arguing that wider analyst following and a larger amount of institutional investors are positively related to the availability of information, and thus diminish the probability of hedging. Smaller companies are found less interesting to institutional investors and therefore less followed by analyst, which indicates they might have an information advantage that can be valuable to shareholders. An interesting perspective is provided by the newfound market of small start-up companies, around which a whole industry has sprung up in the past ten years. Microscopic companies with little proven business are valued based on the uncertain outcomes of their ideas. Combine a large amount of such companies in a portfolio and the risk is more spread out. One surprisingly good outcome can outweigh many less successful ones.

Along with fewer resources to spend, smaller companies also face the disadvantage of less credibility towards outside stakeholders. For example, smaller companies would commonly find their external financing more costly, providing additional cause to actively manage risk.

Froot, Scharfstein, and Stein (1993) argue that firms for which external financing is more costly would be more likely to use risk management, because information asymmetries and transaction costs are expected to be greater for small firms.

A variety of studies examine firm size as an explanatory variable of hedging, yet the collective evidence does not suggest that a single dominant motive explains the relation between firm size and hedging. One would expect to find that small firms, which are more likely to experience financial distress, would be more likely to hedge; however, hedging seems to be driven by economies of scale, reflecting the high fixed costs of establishing risk management programs. Studies examining hedging via forwards, futures, options, and swaps generally conclude that large firms hedge more (Nance, Smith, and Smithson (1993)). In support of Nance, Smith, and Smithson, Jin and Jorion (2006) find that risk management activities in general are found to be more prevalent in large firms. While the empirical literature focuses on the relation between firm characteristics and hedging, the results for trying to identify which theory best explains actual hedging activities have been mixed.

Smaller firms could be drawn to low-cost risk management services if such alternatives were readily available. A specific niche could be small, private and closely held companies whose owners risk characteristics favour active firm level risk management. This paper examines the possibilities of one model, fit for such clientele.

2.5.4 Shareholders' risk characteristics and tolerance

Along with firm size, the ownership and especially the owners' risk characteristics have been shown to influence risk management activities. In addition to the personal risk tolerance of owners and managers, their commitment to the company in the long run is also of great importance. Strong and prominent owners who are committed both financially and socially are generally seen to represent dynamic decision making and decisive leadership. However, concentrated control may also have its shortcomings. Aggregate previous literature suggests that family ownership as an organizational form leads to inferior firm performance. Founding families have concerns and interests of their own, such as stability and capital preservation that may not align with the interests of other investors or the firm. Fama and Jensen (1983) find that the combination of ownership and control enables manager-owners to extract

personal benefits from the company at the cost of other shareholders. Jensen and Meckling (1976) point out that the owners of leveraged firms can have incentives to increase the firm's riskiness with derivatives to transfer wealth from bond holders to stock holders, in other words to increase its volatility by speculating.

A more recent study of family and non-family firms in the S&P 500 by Anderson and Reeb (2003a) finds that family firms with either an insider or outsider CEO perform better than nonfamily firms, suggesting no widespread conduct of value extraction. They continue to claim that minority shareholders in large U.S. companies actually benefit from the presence of founding families. In their second 2003 paper Anderson and Reeb (2003b) find the ill-diversified nature of controlling families' portfolios a contributing factor to active risk management and the pursuing of projects with imperfectly correlated cash flows.

2.5.5 Value maximizing risk management

Risk management, alike with any specific activity a profit seeking company undertakes, can also be motivated by the most common underlying purpose, maximizing enterprise value. Several studies have attempted to provide an estimate of increased market capitalization with direct connection to risk management and hedging. In their 2001 study Allayannis and Weston directly test the relation between firm value and the use of foreign currency derivatives. Using a sample of 720 large firms between 1990 and 1995, they find that the value of firms that hedge, on average, is higher by about 5%. Carter, Rogers and Simkins (2006) examine the case of fuel hedging for a sample of U.S. airlines and report an even higher hedging premium of approximately 14%. A 2006 paper by Jin and Jorion verifies that for some companies in the oil and gas industry hedging reduces the firm's stock price sensitivity to its resource prices, but contrary to other studies they find that hedging does not seem to affect the firm's market value. In other words, they concluded the market prices the protection from resource price volatility to be worth roughly the same as the risk management activities cost.

Guay and Kothari (2003) analyze the economic effects of derivatives positions for a sample of non-financial derivatives users. They conclude that potential gains on derivatives are small compared to cash flows or movements in equity values, and cannot possibly have an effect of

the magnitude claimed. Their interpretation is that either the observed increase in market values is driven by other, value-enhancing risk management activities, such as operational hedges, that are positively correlated with the derivatives positions, or that it is spurious.

More generally, finding correlation between hedging and firm value may instead reflect the association between two endogenous variables. If hedging would be known to increase firm value, we should observe all companies operating at the optimum. This endogeneity problem in research could possibly be alleviated by selecting firms within the same industry, for which both financial exposure is important and firms vastly differ in terms of their hedging ratios.

On the whole, however, there is mixed support for value maximization theories. Mian (1996) surveys their implications and reports that the only reliable observation is that hedging firms tend to be larger. Similarly, Tufano (1996) examines the hedging activities of gold mining firms and finds no support for the value maximization theory. Furthermore, he finds strong evidence that supports the managerial risk-aversion theory, according to which managers who hold more stock tend to undertake more hedging activities.

The absence of a distinct hedging premium refutes the hypothesis that risk management is always a positive-value proposition, suggesting that differences in characteristics between risk classes are crucial to their active management. Jin and Jorion (2006) study the commodity risk exposures of oil and gas producers and the foreign currency risk exposures of large U.S. multinationals. They find that for oil and gas producers, the commodity risk exposure is both easy to identify and easy to hedge by individual investors. Foreign currency risk exposures however, are much harder for individuals to assess as the currency prices affect both sales and expenses. The pooled effect of the two is difficult to estimate and it cannot be expected to remain constant.

For family firms value maximizing may be more interesting in the long term perspective, instead of the shorter view widely adopted by public companies. In this regard value maximizing reinforces the incentive for closely-held firms to hedge, since the owners are less likely to hold well-diversified portfolios and, thus, have definite reasons to induce managers to reduce the variance of the firm's economic value. As mentioned before, the holdings in such companies are more important to the individual owners and thus decisions concerning the companies' future are more stressed. Risk management for these companies can be

considered to have a longer scope than a fiscal year or several. How many public companies think of the future ten or twenty years ahead, when every quarter is when proof of skill has to be provided. Closely held family firms plan their actions reaching future generations. Their decisions are meant to pave the way for years to come and similarly the risks being managed are larger in scale. How the long term position of the company is secured and where are the markets' other players directing their attention.

2.6 Studies on non-financial firms' hedging activities

For non-financial firms the existing evidence on risk management methods is scarce. Past studies in the field have commonly been aimed at determining why companies use derivatives to reduce risks, not to find out whether they are actively managing risk or using derivatives in the first place. Academic discussion has focused primarily, if not exclusively, on financial companies, despite the fact that non-financial corporations are also large derivative users (Bailly et al. (2003)). Bodnar et al. (1996) conducted an extensive survey on corporate derivatives use by non-financial firms. Their major findings are that at the time, less than half of non-financial firms used derivatives, with higher concentration in larger firms and the commodity and manufacturing sectors. They suggest that derivatives use should become more popular as knowledge about them increases. In 1998 Bodnar et al. return to the topic and report findings on a new survey. The intensity of derivatives use appears to have increased, but unlike expected, the total percentage of firms using derivatives has not changed materially. Bailly et al. (2003) carried out a similar study in the UK, sending questionnaires to 629 finance directors of corporations listed on the London Stock Exchange. They received 234 usable answers and concluded that firm size is positively correlated with interest rate derivatives usage. The most common risk targeted by derivatives usage was foreign currency exposure, and equity exposure was the least managed. The companies' strongest objective of derivatives use was managing the volatility in accounting earnings.

Another concern that arises in past literature is whether risk management activities actually lower firms' riskiness. Hentschel and Kothari (2001) conclude in their study of 425 large U.S. corporations that typically public companies do not either reduce or increase their risk with the use of derivatives. In addition, they find no support for the argument that corporations use financial and commodity derivatives to speculate and, thus, place shareholders' wealth at

unnecessary risk. They establish that firms primarily use derivatives to reduce the risks associated with short-term contracts, which tends to have immaterial effects on overall firm volatility. The focus on short perspective is undoubtedly a direct consequence of the general emphasis on quarterly economy. If the riskiness of a company remains constant, then the long term benefits of a risk management program are questionable.

Tufano (1996) studied risk management in the gold mining industry, and found support to the suggestion that derivates are used to reduce risks. He also discovered a link between management ownership and risk management activities - managers who own more shares manage more risk, and conversely managers who own more options manage less risk. His study poses the question whether managers of companies engage in risk management to maximize firm value or to reduce their own personal risk.

An interesting alternative to the commonly available hedging choices was examined by Strong in 1991. The study aimed to test whether a portfolio consisting of publicly listed oil companies' common stock could be used as a hedge against oil price movements. He used two different data sets, firstly the equity returns of 25 major oil companies and the spot price of Mideast Light 34 crude oil, and secondly 238 oil-related companies and West Texas Intermediate crude oil. The data covered the periods 1975-1985 and 1982-1987, respectively. However, in his paper he finds no practical method to use an oil share portfolio to hedge oil price risk, much due to the low effect of oil price on firm values in the industry. Strong does not conclude whether or not the companies in both datasets have hedged their own exposure to oil price and in what degree. If the companies have hedged their exposure then the effect of oil price movements on the company share price should be lower than it would have been without the hedge. As mentioned earlier, risk management has been shown to successfully lower the stock price volatility caused by resource prices (Jin and Jorion (2006)). A similar point of view to risk management was adopted by Schipper and Thompson (1981) when they attempted to use stock industry portfolios to hedge against changes in GNP and the general price level. They report findings in support of the possibility of forming portfolios of stocks which hedge against unanticipated changes in macroeconomic indicators or shifts in the consumption-investment opportunity set. However, they note that in practice it appears that additional information besides the past history of return volatility will have to be used in the portfolio formation process. Gay and Manaster (1982) studied the hedging of commodity price inflation by forming portfolios of stocks and U.S. Treasury bills that hedge against price

changes of various commodities. They found that the common shares of firms in industries closely related to specific commodities did not appear to have any advantage as hedging devices for price changes of the related commodity. Moreover, portfolios of stocks and 6-month Treasury bills did not appear to contain any additional information regarding commodity price inflation beyond that contained in the return on a 1-month bill. Again, the hedging activities of said companies were not examined, which leaves the conclusion of the study dubious.

All the topics included in the literature review were considered meaningful in building the core of this study. All areas have partial or complete applicability to the case at hand, and were organized in order so that the trail of thought would entice the reader to await further examination. The relevance of risk management to a closely-held private company suggested by a number of authors will be tested, with the assumption that Otavamedia's shareholders have ill-diversified portfolios. The hedging method implemented by Strong (1991), Schipper and Thompson (1981), and Gay and Manaster (1982) will be applied to inspect the possibilities in the Finnish media market. The study will also expand on Törmä's (2009) MBA thesis in determining Otavamedia's media sales cash flow correlation on the Finnish advertisement benchmark with both quarterly and monthly data.

The next section introduces the hypotheses of the paper.

3. Hypotheses

This section presents the hypotheses of the study. The three hypotheses are tested on the four elements of data included in the study: The Finnish media sales benchmark, competitor's share price and stock exchange index performance, the monthly media sales figures of Otavamedia, and the control variables. The control variables are the 12 month Euribor rate, the Finnish consumer price index KHI (1995=100), and the wood pulp price index. The data and methods are further presented in section 4.

The first hypothesis expects that the case company's media sales cash flow is correlated with its' competitors cash flow streams, i.e. that there are no significant differences in media sales cash flow growth between media companies in Finland. The growth of the media sales cash flow of publicly listed media companies should naturally be at least partly reflected in the

share price of the said company, influenced by the relative significance of media sales to the company's cash flow. Thus the media sales of Otavamedia are assumed to be correlated with its' competitors share prices. Due to the quarterly nature of public companies' financial reporting, different lag intervals in Otavamedia's sales are tested for the highest correlation. The correlation is expected to be limited by the companies' non-media sales related cash flows and the profitability of cash flows related to media sales.

Hypothesis 1 (H1): Otavamedia's media sales cash flow is positively and significantly correlated with its' competitors share prices.

The second hypothesis continues on hypothesis 1. Based on the correlations between Otavamedia's media sales cash flow and its' competitors share prices, it is assumed that the share prices of the public companies, in collaboration with the general stock market index, can be used to lower the volatility of the case company's media cash flows. The assumption is that when negated for general market growth, the media sales cash flows of said companies are significant enough to be substantially reflected in their share price. Together with the reduction in volatility, it is assumed that the hedge portfolios can generate a positive cash flow effect to benefit Otavamedia's media sales. The portfolios are essentially expected to generate positive cash flow, which when added to standalone media sales cash flow, will increase the average monthly total cash flows. Two different statistical methods of determining correct hedge ratios will be tested in the study.

Hypothesis 2 (H2): Public competitors' share price changes can be exploited to lower the volatility of Otavamedia's media sales cash flows and earn excess cash flows.

The third hypothesis assumes the advance information provided by the media sales order book can accurately predict future cash flows, and can be used to better target the time periods when it is beneficial to hedge. Months of negative cash flow growth could be identified beforehand and by hedging only such months even higher cash flow premiums could be reaped.

Hypothesis 3 (H3): The annual cash flow premium can be increased by activating the hedge only for time periods with negative expected media sales cash flow growth.

The fourth hypothesis is an extension to hypothesis 3. If the annual cash flow premium is increased by activating the hedge only for time periods with negative media sales cash flow growth, then perhaps the position could be swapped to boost the cash flow premium even more during good sales cycles. If this turns out possible, then the portfolio could have two roles depending on the prevalent sales cycle.

Hypothesis 4 (H4): If swapped into a speculative position, the portfolio can provide additional cash flows during periods of strong media sales performance.

4. Data and research methods

This section describes the data and research methods used in the paper. Firstly the data is broken down to four components and each component is described individually along with arguments in favor of using that specific dataset. Secondly the data sources for each component are introduced. And thirdly, the methods used to analyze the data are presented.

4.1 Data

The data used in the study consists of four elements: The Finnish media sales benchmark, competitor's share price and stock exchange index performance, the monthly media sales figures of Otavamedia, and the control variables. Next the dataset is described more specifically, after which all the included public companies are introduced. Following the company introductions the control variables are presented.

4.2 Data description

The data consists of the following four components: Otavamedia's internal media sales figures, a benchmark of Finnish advertising volumes by advertisement category, competitor/media industry security price data, and the three control variables. The control variables included in the study are the 12 month Euribor rate, the Finnish consumer price index KHI (1995=100), and the wood pulp price index. More thorough introductions to the control variables are presented in section 4.1.3.

The internal sales figures are from January 1998 to December 2012, totaling 168 months or 56 quarters. Otavamedia's media sales have been under academic review before: In his MBA thesis, Törmä (2009) looked at annual media sales volumes and their correlation with the general economy. He found that Finnish magazines' media sales are highly dependable on the general economy (i.e. changes in GDP), and therefore are predictable based on macroeconomic indicators. While annual volumes may give us indication of relationships on such, macroeconomic levels, they are not specific enough to build a hedge portfolio on, as there appear to be significant differences between months and quarters. For example, the months of February through May and the months leading up to December have much higher advertisement spending than January or the summer months. All tables and figures will therefore primarily be based on monthly data, but a quarterly perspective is also assumed to look into quarterly hedging due to the listed companies' reporting schedules that reveal the state of media sales to the public.

The following figures display the annual, quarterly, and monthly development of Otavamedia's media sales cash flow as an index on the year 1998's respective time period. Monthly and quarterly fluctuations are apparent, supporting the choice of monthly values in further examination and tests.

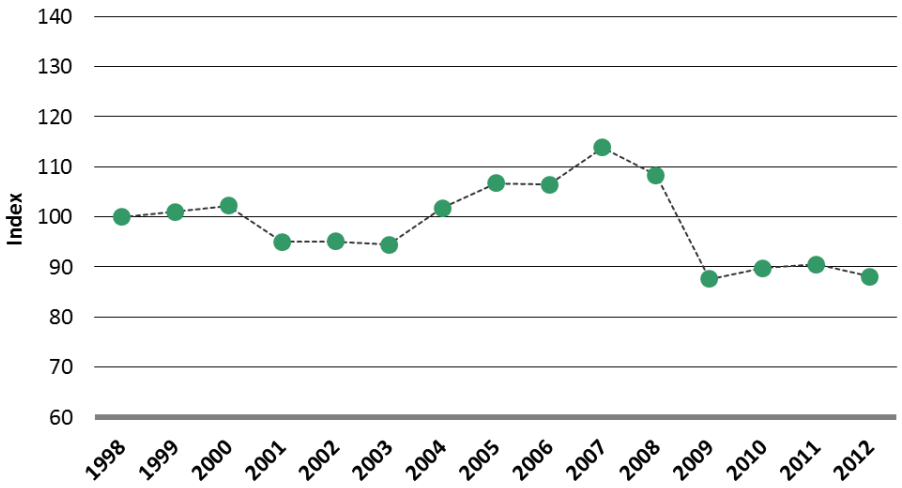


Figure 2. Otavamedia's media sales cash flow annual volume
The year 1998 is set as 100, and the following years are calculated as an index on the cash flow of 1998.

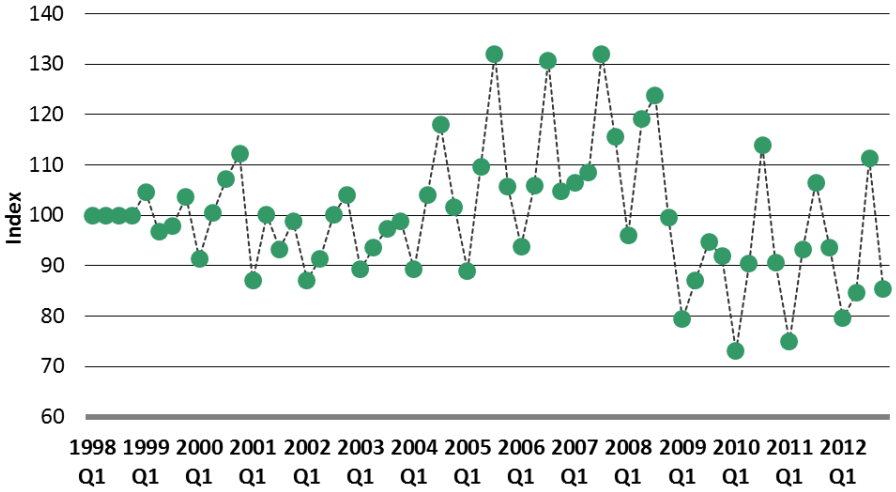


Figure 3. Otavamedia's media sales cash flow quarterly volume
The quarters of year 1998 are set as 100, and the quarters of following years are calculated as an index on the quarterly cash flow of 1998.

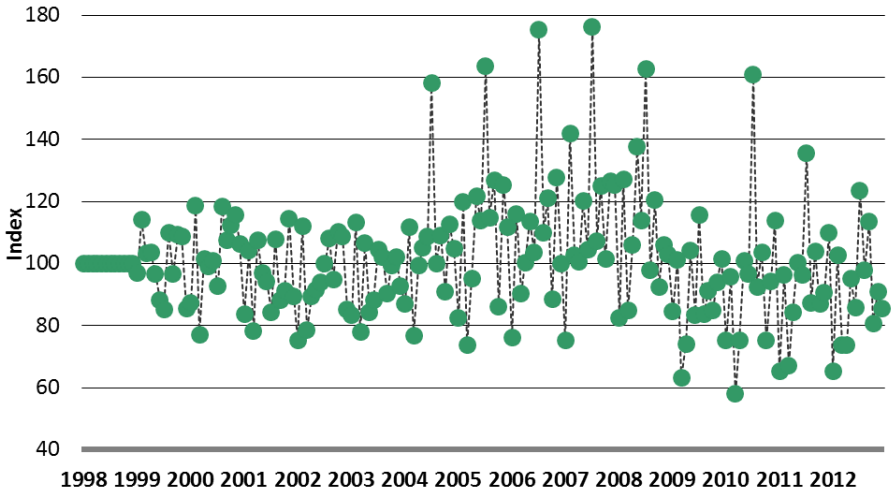


Figure 4. Otavamedia's media sales monthly cash flow volume
The monthly sales of year 1998 are set as 100, and the monthly sales of following years are calculated as an index on the monthly sales of the year 1998.

A quick look at the annual, quarterly, and monthly indexes on the year 1998 reveals the differences in fluctuations. As the indexes are quarter to quarter and month to month, intra-year cyclicality is accounted for. Therefore the traditionally lower sales volume during summer months and the peak in December do not distort comparability between time periods. The minimum, maximum and mean indexes for annual volumes are 88, 114, and 99 respectively. For quarterly volumes the index minimum, maximum and mean are 73, 132, and 100 respectively. As is defined by mathematic statistics, monthly figures have the highest

index variance. The minimum is 58, maximum 176, and mean 101. Table I sums up these observations.

Table I
Media sales cash flow indexes on the year 1998 annually, quarterly and monthly
The examination of annual, quarterly and monthly indexes on the year 1998's media sales cash flow indicates that a shorter period of inspection reveals higher variance in sales. The year, quarters, and months of 1998 are set to 100, and the following time periods are displayed as an index of the sales in 1998.

	Annual sales	Quarterly sales	Monthly sales
Min.	88	73	58
Max.	114	132	176
Mean	99	100	101
N	14	56	168

The media sales benchmark provided by TNS Gallup Oy spans from January 1992 to July 2010, totaling 223 months or 55 quarters. This data is mainly utilized to witness the relevance of such a benchmark on a) Otavamedia's media sales and b) Competing media companies' stock performance. Competitor and media industry security price data sources are defined later in section 4.2. Included public Finnish companies are Sanoma Corporation, Alma Media, and Talentum, of which Alma Media and Talentum are more focused in Finland and more dependent on media sales.

The media sales benchmark and Otavamedia's media sales cash flows should in theory both provide similar estimations of future share prices of public media companies. A simple test of correlations to said dependent variables was therefore carried out to see whether this truly is the case. Not stating the significance of these correlations, it seems the media benchmark has a stronger relationship with media companies' share prices than Otavamedia's media sales cash flow. The significance of Otavamedia's power as a predictor to share prices will be tested later in section 5.1.1. Table II summarizes the correlations of selected securities to both Otavamedia's media sales and the benchmark.

Table II
Correlations of Media Share Returns to Otavamedia's Media Sales Cash Flow

Panel A shows the correlations between selected securities' monthly returns and media sales cash flow of Otavamedia. Correlations are examined with four different lag periods (no lag, 1 month, 2 months, and 3 months), so that the security price is lagged while Otavamedia's media sales as the predictor remain the same. Panel B displays the correlations between the same securities and a Finnish media sales benchmark produced by TNS Gallup Oy. The correlations were derived by regressing monthly security price data on Otavamedia's monthly media sales (panel A) and the monthly media sales benchmark (panel B).

Panel A: Otavamedia's Media Sales

	No lag	Lag 1m	Lag 2m	Lag 3m
Sanoma	0.29	0.30	**0.35**	0.34
Alma Media	**0.27**	0.20	0.24	0.26
Talentum	0.05	0.04	**0.06**	0.06
OMXH	0.15	0.15	0.16	**0.17**
OMXH-25	0.24	0.24	0.26	**0.28**

Panel B: Media Sales Benchmark

	No lag	Lag 1m	Lag 2m	Lag 3m
Sanoma	0.58	0.62	0.64	**0.66**
Alma Media	0.67	0.73	**0.74**	0.73
Talentum	-0.09	-0.09	-0.10	-0.10
OMXH	0.25	0.28	0.31	**0.32**
OMXH-25	0.60	0.64	0.66	**0.67**

Panel A shows the correlations between selected securities' monthly returns and media sales of Otavamedia. Correlations are examined with four different lag periods (no lag, 1 month, 2 months, and 3 months), so that the security price is lagged while Otavamedia's media sales as the predictor remains the same. The resulting correlations in panel A are not as high as expected, but with the sample size of 168 we can most definitely state that Sanoma Corporation's stock price is significantly correlated with Otavamedia's media sales cash flow. In the case of Alma media the results are affected by the smaller sample size of 93. The media sales benchmark in panel B shows much higher correlations, signaling high predictive power for the estimated overall advertising spending figure.

Table III sums up all the variables' descriptive statistics: sample size, mean, standard deviation, minimum and maximum value. The values are in their unedited real units, not as their time series changes. Otavamedia's monthly media sales cash flow represented by OM is in thousands of euros. The market indexes OMX25 and OMX are the basis points represented by their quotes on the stock market. Sanoma, Talentum and Alma Media are the respective stocks' share prices in Euros. The Euribor is the 12 month Euribor interest rate figure, in

percentages. The consumer price index KHI is the index figure where the year 1995 equals 100. The global wood pulp price index represented by WPMP is the price index quoted by COMEX.

Table III
Data Descriptive Statistics

N is sample size, MEAN is the average value, ST.DEV is the standard deviation, MIN is the minimum value and MAX is the maximum value. OM is Otavamedia's monthly media sales cash flow in thousands of euros. OMX25 and OMX are the market indexes' basis points represented by their quotes on the stock market. Sanoma, Talentum and Alma Media are the respective stocks' share prices in Euros. The Euribor is the 12 month Euribor interest rate figure, in percentages. The consumer price index KHI is the index figure where the year 1995 equals 100. The global wood pulp price index represented by WPMP is the price index quoted by COMEX.

DESCRIPTIVE STATISTICS

	N	MEAN	ST.DEV	MIN	MAX
OM	168	1724.47	462.88	730.00	2804.00
OMX25	168	2083.15	566.38	1107.38	3356.30
OMX	168	7849.71	2685.39	4395.43	17734.54
SANOMA	168	14.47	4.25	6.75	23.57
TALENTUM	168	3.20	2.24	1.16	16.00
ALMA MEDIA	93	7.37	1.84	4.55	11.76
EURIBOR	168	2.94	1.28	0.54	5.50
KHI	168	118.07	8.42	103.20	134.90
WPMP	168	554.32	89.69	388.28	809.93

The inherent correlations among independent variables may influence test results, in that the portfolios consisting of more than one security share factors unaccounted for in the study. Due to such aspects, it is acknowledged that the variables may be meaningfully correlated with each other, and thus a simple test of relationships was carried out. These results are not proposed as actual results of the study, but rather an aspect worth considering as conclusions are drawn from results. High correlations of above 0.5 are found in several cases, for example Alma Media and the market indexes OMXH and OMX25, 0.92 and 0.85 respectively. Also, the correlation between Sanoma and Alma Media is 0.75. Table IV displays these indications of possible dependency and the rest of the correlation matrix of all variables included in the study.

Table IV
Correlation Matrix Of Variables

This table presents the correlations between the variables that were tested for the model. Lagged versions of the variables are not included. Sanoma, Talentum and Alma Media are Finnish publicly listed companies and they represent themselves in the market indexes OMX and OMXH-25. OMXH-25 is an index consisting of the 25 largest companies listed in the Nasdaq OMX Helsinki stock exchange. Sanoma is represented in both indexes. Euribor is the 12-month Euribor interest rate. KHI is the Finnish consumer price index (1995=100). WPMP is the commodity price index for Wood Pulp.

	Otavamedia	Sanoma	Alma Media	Talentum	OMXH	OMX25	Euribor	KHI	WPMP
Otavamedia	1,0000								
Sanoma	0,2988	1,0000							
Alma Media	0,3041	**0,7485**	1,0000						
Talentum	0,0823	0,2928	**0,6290**	1,0000					
OMXH	0,1740	**0,5160**	**0,9220**	**0,6386**	1,0000				
OMXH-25	0,2156	**0,6634**	**0,8555**	0,3664	**0,7551**	1,0000			
Euribor	0,2721	0,3514	**0,7463**	0,4139	**0,7150**	0,3923	1,0000		
KHI	-0,2763	0,0574	0,1187	0,1131	0,0774	0,0876	0,0075	1,0000	
WPMP	-0,0271	0,1515	0,1153	0,2638	0,1569	0,1515	-0,0752	-0,0447	1,0000

4.2.1 Company introductions

This section gives brief introductions to the Finnish media companies selected to be included in the study. The companies are Sanoma Corporation, Talentum Corporation, and Alma Media Corporation.

Sanoma Corporation

Sanoma is the leading media company in Finland, and a strong European media group with activities in over 20 countries. Their diversified business portfolio consists of products and services for both consumers and corporate customers. Their divisions are as follows: Sanoma Media, Sanoma News, Sanoma Learning & Literature and Sanoma Trade. Their mission is to offer people information, education, entertainment and experiences, every day, in their own languages, respecting local cultures. Sanoma Corporation's share (SAA) is listed in the Large Cap segment of the NASDAQ OMX Helsinki, and is included in both the OMXH and the OMXH-25 indexes. Their share price data is available for the whole period under review. In 2012 their annual revenue amounted to 2,37 billion Euros and their earnings before interest, taxes and amortization was 182,3 million Euros.

Talentum Corporation

Talentum's core business areas include publishing media and literature for professionals of various fields and organising up-to-date training and other events. They are more focused on business literature and media in the whole, chimed by their mission statement: "We help professionals succeed". Telemarketing is a mentioned as a strategic distribution channel for their publishing efforts. Talentum Corporation's share (TTM) is listed in the Small Cap segment of the NASDAQ OMX Helsinki, and is included in the OMXH index. Their share price data is available for the whole period under review. In 2012 their annual revenue amounted to 77,2 million Euros and their earnings before interest, taxes and amortization was -0,5 million Euros.

Alma Media Corporation

Alma Media is a dynamic media company whose best-known products are the Aamulehti, Iltalehti, Kauppalehti and Etuovi.com. Alma Media employs nearly 2,800 professionals. Alma Media's share (ALN1V) is listed in the Mid Cap segment of the NASDAQ OMX Helsinki and is included in the OMXH index. Their share price information is available since they got listed on the 28th of April in 2005. In 2012 their annual revenue amounted to 320,1 million Euros and their earnings before interest, taxes and amortization was 26,5 million Euros.

4.2.2 Control variables

This section introduces the chosen control variables in more detail. Each variables' significance is also demonstrated and it is explained why the variable was chosen. The control variables are the 12 month Euribor rate, the Finnish consumer price index KHI (1995=100), and the wood pulp price index (WPMP).

12-month Euribor

The 12 month Euribor rate represents the rate at which the approximately 50 prime banks of the Euro area pay interest for the next 12 months. From Finland in this sample of prime banks Nordea is included. In this paper the Euribor rate serves as a control variable embodying the flow of capital to equity markets. When interest rates are high, less money is invested in equities and more in fixed income instruments. This is due to higher interest on debt

instruments but also because companies' cost of capital is affecting their profits. The control effectively means that results are not due to shifts in equity and debt market capitalization.

Finnish consumer price index

The Finnish consumer price index is a metric of price development of goods and services in Finland, and is used as a general measure of inflation. Statistics Finland is responsible for the calculation, which aims to weigh together the prices of different commodities with their share of consumption. In this study the variable is meant to control for general inflation in Finland. This prevents the results being an outcome overall price increases which create additional correlation.

Wood pulp price index

Approximately 70 percent of global pulp production is integrated with paper production, and needless to say paper is a major resource for print media companies such as the ones included in this study. In addition to the general consumer price index, a more industry-specific measure of prices was seen appropriate. The prices are based on futures contracts and reported monthly by COMEX. The purpose of the wood pulp price index control is to have the effect of a key resource price ruled out as a possible omitted explanatory variable.

4.3 Data sources

This section details the data sources of each dataset. Beginning with the media sales benchmark by TNS Gallup Oy, and ending with the control variables, all data sources are listed with further relevant details.

The media sales benchmark was provided by a Finnish research company called TNS Gallup Oy, which is part of the international communication services group WPP. The data spans from January 1992 to July 2010, totaling 223 months or 55 quarters. The data was given to me directly, to be used only for this study. TNS Gallup Oy collaborates with Otavamedia and is also one of its key suppliers of market research, which helped me in obtaining the data.

The daily security price data for the publicly listed companies was retrieved from the Thomson ONE database. Included companies are Sanoma Corporation, Alma Media, and

Talentum. Also from Thomson ONE were obtained the other relevant stock information such as splits, cash dividends and repurchases.

The daily index point values for the two Finnish indexes, the OMXH and the OMXH25, were downloaded from the Nasdaq OMX Nordic website (http://www.nasdaqomxnordic.com) where such data is easily accessed.

Otavamedia's internal media sales figures are from January 1998 to December 2012, totaling 168 months or 56 quarters. This data was accessed by the author at his workplace. This data is only meant to be used for research purposes, and is not to be disclosed at actual monthly levels.

The control variables are all readily available data. The Euribor 12-month rate was acquired from the Bank of Finland online services (http://www.bof.fi). The Finnish consumer price index KHI is published monthly by the Statistics Finland and can be downloaded at their web services (http://www.tilastokeskus.fi/index_en.html). The wood pulp monthly price index is upheld by COMEX and the CME Group. Data is available at (http://www.cmegroup.com).

4.4 Methodology

In order to effectively hedge, or lower a particular time series' volatility, sufficiently imperfectly correlated time series must be found. For Otavamedia's media sales cash flow, a beneficial hedge portfolio would be one with high enough negative correlation with media sales changes, but which are well diversified with regard to Otavamedia's other sources of risk. Since we are concerned with both stock market and media sales cash flow risk, the hedge portfolio is assumed to consist of both short and long positions. The focus of the construction of hedge portfolios is then a function of that part of media sales cash flow uncorrelated with the market return. Technically, the objective is to identify those portfolios that have the most constant positive covariance with media sales changes but are minimum variance with regard to other factors.

The optimal hedge ratios for a time series are traditionally constructed by performing a regular ordinary least squares regression on it and individual hedge instrument returns. The

resulting regression coefficients are then used as the hedge ratio when estimating portfolio performance in the following period. A major drawback of this method is that the regression requires that the number of different instruments inspected (independent variables) in the equation is less than the number of time series observations. In practice, this means that such a technique can only be used for a small number of securities, especially if nonstationarity problems require annual or even longer periods between portfolio adjustments.

The second-best approach adopted in previous research places assets into ad hoc portfolios and then evaluates these portfolios against each other. Unfortunately, this requires either and extremely large number of iterations or ignores the covariances between the shares in constructing the portfolio. The result is that it is difficult to know if the right mix has been achieved. A further difficulty is that this portfolio-construction process is likely to produce suboptimal hedge portfolios. The two stage procedure frequently employed involves selection of the "best" combination of instruments held in an equally weighted portfolio; the second step then mixes these shares in different proportions to try to improve upon the hedging performance of the equally weighted portfolio from the first step. However, there is no guarantee that this procedure will produce the best performing hedge portfolio. The result is that portfolio considerations require simultaneous concern of which instruments are held in the portfolio and in what proportions.

The problem with tests which involve hold-out samples is that efficiency is lost in the hedge ratio estimation phase of the test. Information contained in the hold-out sample is not utilized. On the other hand, verification of hedging potential out of sample is important for an investor actually interested in forming an operational hedge portfolio. For example Schipper and Thompson (1981) found that out of sample their hedge portfolios did not provide successful hedges, while within the sample the results were convincing. Another danger of the suggested risk management model lies with basis risk, the possibility that offsetting investments in a hedging strategy will not experience price changes in entirely opposite directions from each other. This imperfect correlation between the two investments creates the potential for excess gains or losses in a hedging strategy, thus adding volatility to the position.

As exemplified in earlier studies, such as Armeanu et al. (2013), the optimal hedge ratio has to in practice be estimated. There are several aspects to take into consideration when choosing the proper model. Juhl et al. (2012) find that what is actually most relevant is the time series

behavior of the data. There are three conditions that must be examined: whether the series contain unit root, whether it contains unit root but is not cointegrated, and whether it contains unit root and is cointegrated. In the case that none of these conditions are met, a simple regression on the time series can be employed. If unit root are present but the data is not cointegrated, the regression can be applied on the changes in the time series data, instead of the actual levels. Finally if the series contain unit root and are cointegrated, an error-correction model can be used to run tests on the data.

A restatement of the portfolio construction process is worthwhile at this point. First a series of individual ordinary least squares regressions that relate the return on each company's shares to equity market returns (OMXH and OMX25) and to Otavamedia's media sales cash flow changes are estimated. This is analogous to estimating market and media sales "betas" for each company. After indicating each variables' relevance to Otavamedia's media sales cash flow, the hedge position estimates are examined by the following categories: single security hedges, single security and market index hedges, 2 securities and market index, and finally all three securities and market index. All categories are also inspected with the three different adjustment periods: a constant hedge, a monthly adjusted, and a quarterly adjusted hedge. Different lag periods from 0 to 3 months are tested.

First the tests are, as mentioned, carried out on a simple OLS regression, and then the time series are tested for unit root and cointegration. The test for unit root is executed in Stata and is called the augmented Dickey-Fuller test. The test for cointegration is also carried out in Stata and is called the Johansen test. These tests are performed in order to assess whether a vector error correcting model (VECM) would be applicable. The VECM is supposed to provide more accurate estimates than the OLS regression.

The rest of this section is organized as follows: first the augmented Dickey-Fuller test is introduced, followed by the Johansen test for cointegration, then the OLS regression specifications are presented, and finally the VEC model specifications are exhibited.

4.4.1 Augmented Dickey-Fuller test for unit root

The OLS regression may provide some indication of the variables' hedging capability, but it is seen necessary to estimate the hedge ratios with a more complex prediction model as well. In order to determine which regression models can and should be used, the data must first be tested for unit root and cointegration. Both of these conditions can be tested for statistically. In order to test for unit root, i.e. whether the data is stationary, we apply the augmented Dickey-Fuller test. The Dickey¬-Fuller test for unit root was carried out in Stata, and the output of a single test is displayed below.

```
Dickey-Fuller test for unit root                  Number of obs   =       179

                                  ---------- Interpolated Dickey-Fuller ----------
                 Test             1% Critical       5% Critical      10% Critical
               Statistic             Value             Value             Value
------------------------------------------------------------------------------
 Z(t)           -8.627              -3.484            -2.885            -2.575
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000
```

The null hypothesis of the test is that the time series follows a unit root process. The null can be rejected when the p-value of the test is equal to the 5% level, 0.05. If the null cannot be rejected, it doesn't necessarily mean the data is non-stationary; it is merely more consistent with it. However, if the null can be rejected, it can be stated that the data is not stationary. Results of the test are detailed in table V.

Table V
Augmented Dickey-Fuller Test For Unit Root

The results for the augmented Dickey-Fuller test for unit root performed in Stata. N is sample size, T-stat is the t-statistic, P-value is the probability of unit root, 1%, 5%, and 10% critical values represent the t-statistic of respective probabilities for unit root.

Augmented Dickey-Fuller test for unit root						
Variable	N	T-stat	P-value	1 % Critical Value	5 % Critical value	10 % Critical Value
Otavamedia	179	-8.627	0.0000	-3.484	-2.885	-2.575
OMX25	179	-1.705	0.4285	-3.484	-2.885	-2.575
OMXH	179	-1.782	0.3897	-3.484	-2.885	-2.575
Sanoma	179	-1.722	0.4197	-3.484	-2.885	-2.575
Talentum	179	-2.201	0.2061	-3.484	-2.885	-2.575
Alma	92	-1.112	0.7104	-3.521	-2.896	-2.583

For all but Alma Media the sample size in the unit root test is 179. Alma Media was not listed in the Helsinki Stock Exchange for the whole period under review, and thus its sample size is limited to 92 monthly data points. The smaller sample size also causes Alma Media's unit root tests' higher critical values. In order to reject the null hypothesis of the Dickey-Fuller test, the p-value for each variable should be 0.05 or lower. This is only the case with Otavamedia's media sales cash flow, and therefore we cannot reject the null and must conclude the data may be non-stationary. Because the data may be non-stationary, regression tests cannot be ran on actual data levels, but must be applied on the changes in the time series data.

4.4.2 The johansen test for cointegration

Following from the augmented Dickey-Fuller test for unit root, in order to test whether OLS regression on the changes in the time series is sufficient, the data is tested for cointegration with the Johansen test. The null hypothesis of the Johansen test is that variables must be non-stationary at level, but when converted into first differenced, i.e. the series of changes from one period to the next, they must be stationary. What this means is that the values themselves are not stationary, but their changes over time are. The Johansen test was performed in Stata, and the outputs for both a test with all variables and a test omitting Alma Media are presented below, respectively.

Johansen tests for cointegration

Trend: constant — Number of obs = 91
Sample: 2005m6 - 2012m12 — Lags = 2

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	30	-1571.9786	.	137.7455	68.52
1	39	-1523.7085	0.65385	41.2053*	47.21
2	46	-1513.3143	0.20423	20.4169	29.68
3	51	-1506.7829	0.13372	7.3541	15.41
4	54	-1503.1069	0.07761	0.0020	3.76
5	55	-1503.1059	0.00002		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	30	-1571.9786	.	96.5402	33.46
1	39	-1523.7085	0.65385	20.7884	27.07
2	46	-1513.3143	0.20423	13.0628	20.97
3	51	-1506.7829	0.13372	7.3521	14.07
4	54	-1503.1069	0.07761	0.0020	3.76
5	55	-1503.1059	0.00002		

Johansen tests for cointegration

Trend: constant — Number of obs = 178
Sample: 1998m3 - 2012m12 — Lags = 2

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	20	-3316.6566	.	170.1267	47.21
1	27	-3244.1645	0.55715	25.1425*	29.68
2	32	-3236.3976	0.08357	9.6089	15.41
3	35	-3232.6674	0.04105	2.1485	3.76
4	36	-3231.5932	0.01200		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	20	-3316.6566	.	144.9842	27.07
1	27	-3244.1645	0.55715	15.5336	20.97
2	32	-3236.3976	0.08357	7.4604	14.07
3	35	-3232.6674	0.04105	2.1485	3.76
4	36	-3231.5932	0.01200		

Analyzing the cointegration test output proceeds as follows: the top row with the zero means no cointegration among the variables, the next row beginning with one means one cointegration, two means two cointegrations and so forth. When the trace value on a row is higher than the 5% critical value, we can reject the null. If the trace statistic is less than the critical value, we accept the null. In the first test with a sample size of 91, on the zero cointegration row it can be seen that the trace statistic 137,7455 is larger than the 5% critical value of 68,52 and therefore we can reject the null hypothesis of no cointegration. On the second row the trace value 41,2053 is smaller than the 5% critical value 47,21 and the null cannot be rejected at this level, the null has to be accepted. There is at least one cointegration in the Johansen test, which means the variables are cointegrated and they have long run association.

The second panel in each output displays the max statistic. The procedure to analyze the output is the same as previously. Again it is discovered the null cannot be rejected at rank 1, which means there is at least one cointegration among the variables. It also means that the variables have cointegration and move together in the long run. Both tests report same results and thus confirm that the variables are cointegrated.

When the variables of a data set are cointegrated, it is advisable to apply the vector error correction model when estimating optimal hedge ratios. If the variables would not be cointegrated, the VECM would not be advisable, but instead the vector autoregressive (VAR) model. The OLS regression as an estimation model is not supported by the discovery of cointegration, but is still used as a part of this study to provide comparison to VECM.

4.4.3 Ordinary least squares regression specifications

The ordinary least squares regression (OLS) is a statistical method for estimating a linear regression model. The method minimizes the sum of squared differences between data points and the estimates predicted by the model. The result is an estimator that can be expressed by a simple formula, and is thought to be easier to understand than many other regression techniques. While the OLS is widely considered to be the most popular regression model, it does have its shortcomings. Outliers can cause the OLS regression to perform weakly when some points in the data have excessively large or small values compared to the rest of the data. Non-linearity can induce problems with the OLS when the data points are in fact, not linear. The model will attempt to fit a line with the optimal predictions, but may fail to do a good job. Too many independent variables can produce serious difficulties in the predictions, since as soon as the number of variables used exceeds the number of data points, the least squares solution will not be unique, and hence the least squares algorithm will fail. The OLS can also sometimes lead to weak predictions when independent variables are significantly correlated to each other. The problem is caused by a large variety of different estimations the model considers equally good. The way that least squares regression measures error is often not the optimal method, or justified by the data error characteristics. Unequal data point variances, i.e. heteroskedasticity, may cause problems even if all other pitfalls of the OLS have been avoided. The difficulty is that the level of noise in the data may be dependent on a variable which has not been considered.

The greater the number of different securities included in the regression, the higher the R^2 is and thus the more effective the hedge. This however, neglects the fact that a greater number of securities also mean a greater amount of transaction costs and other managerial efforts. These economic factors will later be discussed in section 5.6.

The mean and the variance of the monthly cash flows of the hedged portfolio, and the reduction in the variance of the hedged portfolio relative to the unhedged portfolio, are calculated as follows: The sensitivity of each individual security to both the media sales cash flow of Otavamedia and the Finnish media sales benchmark is obtained by regressing the monthly log return of the security on the percentage change of media sales:

$$R_{i,t} = \alpha_i + \beta_i R_{x,t} + e_{i,t}$$

where $R_{i,t}$ is the log return on security *i*, α_i is the constant, β_i measures the exposure of the security to the particular risk factor, $R_{x,t}$ is log return of the risk factor, and $e_{i,t}$ is the error term.

A multiple regression is used to estimate the exposure of the securities to both the Finnish stock market index and media sales cash flow. The log returns on individual securities are expressed as a linear function of the monthly log return on the Finnish market index (OMX25) and the monthly log cash flow of Otavamedia's media sales:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + c_i R_{media,t} + e_{i,t}$$

where $R_{i,t}$ is log return on security *i* in period *t*; $R_{m,t}$ is log return of the market index in period *t*; $R_{media,t}$ is the log of Otavamedia's media sales cash flow during period *t*; α_i, β_i, and c_i are regression coefficients for each company and $e_{i,t}$ is a normally distributed error term with assumed mean of zero.

4.4.4 Vector error correcting model specifications

The vector error correcting model is designed to fit first-differenced stationary time series, and performs better predictions in these circumstances than for example the OLS. Time series that exhibit conditions such as unit root or non-stationarity become problematic when applied to conventional regression estimators, including VARs. These difficulties were illustrated by Granger and Newbold (Journal of econometrics 1974) when they introduced the concept of spurious regressions. It states that if there are two independent random time series, a regression of one of the other can yield a significant coefficient, even if the data are not actually related in any way.

The cointegration rank shows the number of cointegrating vectors in VECM. A rank of two, for example, indicates that two linearly dependent combinations of the non-stationary variables will be stationary. A negative and significant coefficient of the ECM (i.e. *et-1* in the below equations) suggests that any short-term fluctuations between the independent variables and the dependent variable will give rise to a stable long run relationship between the variables.

The vector error correcting model regression form as presented by Engle and Granger (1987):

$$\Delta Y_t = \alpha_1 + p_1 e_1 + \sum_{i=0}^{n} \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} \delta_i \Delta X_{t-i} + \sum_{i=0}^{n} \gamma_i Z_{t-i}$$

$$\Delta X_t = \alpha_2 + p_2 e_{i-1} + \sum_{i=0}^{n} \beta_i Y_{t-i} + \sum_{i=0}^{n} \delta_i \Delta X_{t-i} + \sum_{i=0}^{n} \gamma_i Z_{t-i}$$

4.4.5 Hedge portfolio performance analysis

The portfolios resulting from the OLS and VEC derived hedge ratios are examined month by month with regard to Otavamedia's media sales cash flow. Monthly resulting outcomes are summed and annualized, and then compared on key statistics. The reported values sample size, mean value, standard deviation, max value, min value and the improvement in annualized cash flow for each test are found in appendices.

Ederington (1979) posits that hedging effectiveness depends on the percent reduction in the variance of the portfolio:

$$e = 1 - \frac{\text{Var (R*)}}{\text{Var (U)}}$$, where

Var(R*) = the variance of the hedged portfolio

Var(U) = the variance of an unhedged portfolio.

This effectiveness of the hedged portfolios will be tested with the standard deviation of the monthly values. However, more focus is put on the improvements in annual cash flow of each portfolio, as the lowered volatility of cash flow may not be inclination enough to bring forth action – an improvement in cash flow on the other hand, is more motivational.

5. Results

This section presents the results of the study. First the primary results are displayed, which exhibit the relevance of Otavamedia's media sales cash flow on each dependent variable. Lag periods from 0 to 3 months are examined. Second are shown the dependent variables'

coefficients from both the OLS and VEC models. Next are presented the simple hedge strategy portfolio performances, in the order of portfolio adjustment period from constant to quarterly. Then another perspective is inspected where the hedge is only active for time periods of negative sales growth. And then a speculative model is examined where the hedge is active for negative time periods and swapped opposite on positive time periods. A more thorough inspection is then placed on specific years of media market turmoil, to identify whether the hedging activities would then have proven beneficial. OLS and VEC model portfolios with 2 and 3 short positions and a long market position are examined for each year. Lastly, the economic significance of the results is discussed.

5.1 Primary results

This section displays the primary results of the regression analysis. First the results of the OLS regressions on the three public companies' dependence on Otavamedia's media sales cash flow and the market index are shown. After proving the relevance of Otavamedia's media sales cash flow as a predictor of media companies' stock price growth, the OLS and VEC regression -derived coefficients for the individual hedge ratios used in portfolios are presented.

5.1.1 Media sales cash flow relevance

This section aims to introduce the reader to the relevance of Otavamedia's media sales cash flow in predicting its public competitors' share prices. This is a key assumption of the study, echoed by H1, with crucial impact on hedge portfolio performances. Hypothesis 1 states: Otavamedia's media sales cash flow is positively and significantly correlated with its' competitors share prices. The first hypothesis will be tested in the following ordinary least squares regressions. The tables have two panels to differentiate between the two market indexes OMXH and OMX25, with each lag period in its own table. Table VI summarizes the results of OLS regressions.

Table VI
Relation of Share Prices to Equity Market Indexes and Monthly Media Sales

Share prices include price changes and cash dividends and are adjusted for share splits, share dividends, and share repurchases. Constant is each security's' constant with regard to the model. R_m represents the equity market beta of each company. R_{media} displays the sensitivity to media sales volume. Euribor is the 12-month Euribor interest rate. KHI is the Finnish consumer price index (1995=100). WPMP is the commodity price index for Wood Pulp. R^2 is the coefficient of determination, the proportion of variance accounted for by the model. T-statistics signal statistical significance. L in parentheses represents lagged values, lag in months. For lagged values also the market index and control variables are lagged.

Panel A: OMXH-25

	Constant	t-stat		R_m	t-stat		R_{media}	t-stat		Euribor	t-stat		KHI	t-stat		WPMP	t-stat		R^2	N
Sanoma	-258,7490	-1,20		0,6308	9,00	***	0,3464	**2,71**	***	0,0804	1,32		1,8797	0,94		0,7979	1,33		0,4781	168
Sanoma (L=1)	-62,1998	-0,30		0,6455	9,24	***	0,3467	**2,85**	***	0,0768	1,27		-0,1736	-0,09		0,8691	1,45		0,4586	167
Sanoma (L=2)	15,3254	0,07		0,6566	9,29	***	0,2967	2,39	**	0,0784	1,28		-0,8258	-0,42		0,7792	1,29		0,4804	166
Sanoma (L=3)	-116,4583	-0,54		0,6536	9,08	***	0,2605	2,06	**	0,0853	1,39		0,4541	0,26		0,8483	1,38		0,4758	165
Alma Media	-252,9080	-2,13	**	0,5866	10,47	***	0,0227	0,34		0,2459	**6,33**	***	1,8869	1,72	*	0,7256	1,87	*	0,8264	93
Alma Media (L=1)	-236,6824	-2,11	**	0,5893	10,45	***	-0,0473	-0,73		0,2586	**6,61**	***	1,8287	1,73	*	0,6785	1,72	*	0,8262	92
Alma Media (L=2)	-237,8773	-2,09	**	0,5878	10,32	***	0,0121	0,19		0,2475	**6,21**	***	1,7475	1,63		0,7227	1,84	*	0,8243	91
Alma Media (L=3)	-258,5314	-2,16		0,5877	10,26	***	0,0318	0,47		0,2445	**6,19**	***	1,9166	1,75	*	0,7415	1,86	*	0,8252	90
Talentum	-997,6685	-2,45	**	0,3134	2,37	**	-0,0707	-0,29		0,5734	**5,01**	***	5,4773	1,45		4,5026	**3,98**	***	0,2983	168
Talentum (L=1)	-885,0399	-2,30	**	0,3480	2,66	***	-0,1865	-0,82		0,5746	**5,08**	***	4,5408	1,26		4,3762	**3,89**	***	0,3059	167
Talentum (L=2)	-929,4047	-2,44	**	0,3742	2,87	***	-0,1953	-0,85		0,5640	**5,02**	***	5,1147	1,42		4,2223	**3,79**	***	0,3114	166
Talentum (L=3)	-872,5153	-2,25	**	0,3903	2,99	***	-0,0783	-0,34		0,5429	**4,89**	***	4,4914	1,25		4,1514	**3,71**	***	0,3157	165

Panel B: OMXH

	Constant	t-stat		R_m	t-stat		R_{media}	t-stat		Euribor	t-stat		KHI	t-stat		WPMP	t-stat		R^2	N
Sanoma	-362,0756	-1,48		0,3540	5,19	***	0,5316	**3,71**	***	-0,0717	-0,77		3,1348	1,39		0,8013	1,15		0,3290	168
Sanoma (L=1)	-92,4613	-0,39		0,3639	5,30	***	0,5040	**3,66**	***	-0,0756	-0,81		0,3480	0,16		0,9088	1,29		0,3295	167
Sanoma (L=2)	21,4643	0,09		0,3682	5,28	***	0,4554	**3,23**	***	-0,0742	-0,78		-0,6651	-0,30		0,8238	1,16		0,3188	166
Sanoma (L=3)	-201,0029	-0,82		0,3570	5,08	***	0,4399	**3,09**	***	-0,0587	-0,62		1,4095	0,62		0,9897	1,37		0,3152	165
Alma Media	-151,9847	-1,40		0,5845	12,37	***	-0,0109	-0,18		0,0680	1,55		1,3321	1,33		0,4007	1,12		0,8577	93
Alma Media (L=1)	-152,8426	-1,51		0,5871	12,54	***	-0,0794	-1,37		0,0790	1,80	*	1,4724	1,56		0,3263	0,91		0,8606	92
Alma Media (L=2)	-153,9092	-1,50		0,5833	12,33	***	-0,0170	-0,29		0,0687	1,54		1,3805	1,43		0,3812	1,06		0,8581	91
Alma Media (L=3)	-144,5059	-1,33		0,5840	12,21	***	-0,0123	-0,20		0,0669	1,50		1,2885	1,30		0,3751	1,03		0,8579	90
Talentum	-711,0354	-1,95	*	0,7038	6,95	***	0,0148	0,07		-0,0256	-0,19		4,0238	1,20		2,8328	**2,73**	***	0,4408	168
Talentum (L=1)	-539,6764	-1,57		0,7285	7,30	***	-0,0874	-0,44		-0,0380	-0,28		2,4935	0,78		2,7177	**2,66**	***	0,4555	167
Talentum (L=2)	-553,1944	-1,64		0,7555	7,67	***	-0,0806	-0,41		-0,0685	-0,51		2,8191	0,89		2,4968	2,48	**	0,4706	166
Talentum (L=3)	-534,9354	-1,57		0,7704	7,93	***	0,0000	0,00		-0,0939	-0,72		2,6287	0,84		2,4159	2,42		0,4822	165

*, **, and *** signal 10, 5, and 1 % statistical significance, respectively.

The primary results for share returns indicate all three companies having a significant relationship with both market indexes, which is not surprising as they are included in the index figures. However, only Sanoma Corporation is significantly related to Otavamedia's media sales cash flow. We can therefore only partly accept H1. In conjunction with the OMX 25 market index, Alma Media and Talentum Corporation are both highly influenced by the 12-month Euribor rate. Talentum is also significantly correlated with the commodity price for wood pulp, in the case of both market indexes. The Finnish consumer price index is not significant in determining stock prices.

The different lag periods tested, from 1 to 3 month lagged values, repeat similar relationships as the values representing an immediate response in share prices. The conclusion is that the more share returns are lagged, the lower the dependency between media sales cash flow and share prices becomes. Sanoma Corporation's statistically highest connection with media sales cash flow is found for 1-month lagged and no lag, for OMX25 and OMXH, respectively. Under these specifications, Alma Media and Talentum continually show an insignificant correlation to Otavamedia's media sales cash flow. They remain significantly related only to the market indexes and the control variables the 12-month Euribor and wood pulp price.

From the OLS regression results, it is quickly discovered that Otavamedia's media sales cash flows are not equally effective at predicting the 3 public companies' share prices. H1 can only be partially accepted. Regardless of the discouraging findings, all shares will be included in further tests of hedge ratios and portfolio performance. The market index OMXH will subsequently be ruled out as the OMX25 is currently more straightforward to apply as a practical instrument of risk management. The Seligson & Co asset management company has an exchange-traded fund OMX Helsinki 25 under the ticker SLG OMXH25 which directly tracks the index.

Next, the coefficients that serve as individual securities' hedge ratios are derived via both ordinary least squares and vector error correcting regressions.

5.1.2 OLS and VEC regression coefficients

The hedge ratios for each individual security to be used in the portfolios are derived using both ordinary least squares and vector error correcting regressions. The use of two models instead of one provides a welcome addition to the hedge portfolio sample size. The coefficients of both regression tests are obtained for each portfolio type: the single short position, a single short coupled with a long market position, a portfolio of two shorts and long market position, and finally the portfolio of three shorts and long market position. In the OLS tests lag periods from 0 to 3 months are examined. The VEC is a time series test which by nature accounts for lag periods, and thus the inclusion of data lag periods is not necessary. Table VII details the results of both the OLS and VEC tests.

Table VII
OLS and VEC Derived Hedge Ratios For Media Sales Cash Flow

Stock price and market index hedge ratios for Otavamedia's media sales cash flow derived by ordinary least squares (OLS) regression and vector error correcting (VEC) regression. Stock prices include cash dividends and are adjusted for share splits, share dividends, and share repurchases. L in parentheses denotes lagged values in months. S in parentheses denotes number of short positions in portfolios consisting of more than two positions. Constants are not reported. R_m is the hedge ratio of OMX25. R_{sanoma} represents the hedge ratio of Sanoma corporation. $R_{talentum}$ represents the hedge ratio of Talentum corporation. R_{alma} represents the hedge ratio of Alma Media. R^2 is the adjusted coefficient of determination, the proportion of variance accounted for by the model. T-statistics signal statistical significance. N is sample size.

	Model	R_m	t-stat	R_{sanoma}	t-stat	$R_{talentum}$	t-stat	R_{alma}	t-stat	R^2	N
Sanoma	OLS			0,1458	**4,03** ***					0,09	168
Sanoma (L=1)	OLS			0,1478	**4,09** ***					0,09	167
Sanoma (L=2)	OLS			0,1385	**3,80** ***					0,08	166
Sanoma (L=3)	OLS			0,1283	**3,50** ***					0,07	165
Sanoma	VEC			-0,1771	**-4,20** ***						166
Sanoma and OMX25	OLS	0,0165	0,31	0,1358	**2,80** ***					0,09	168
Sanoma and OMX25 (L=1)	OLS	0,0025	0,05	0,1463	**3,00** ***					0,09	167
Sanoma and OMX25 (L=2)	OLS	0,0227	0,42	0,1246	2,53 **					0,08	166
Sanoma and OMX25 (L=3)	OLS	0,0359	0,66	0,1065	2,15 **					0,07	165
Sanoma and OMX25	VEC	-0,0092	-0,15	-0,1754	**-3,05** ***						166
Talentum	OLS					0,0247	1,06			0,01	168
Talentum (L=1)	OLS					0,0182	0,77			0,00	167
Talentum (L=2)	OLS					0,0237	1,00			0,01	166
Talentum (L=3)	OLS					0,0223	0,94			0,01	165
Talentum	VEC					-0,0479	-1,43				166
Talentum and OMX25	OLS	0,1142	2,62 ***			0,0011	0,05			0,05	168
Talentum and OMX25 (L=1)	OLS	0,1138	2,58 **			-0,0635	-0,25			0,04	167
Talentum and OMX25 (L=2)	OLS	0,1163	2,61 ***			-0,0251	-0,10			0,05	166
Talentum and OMX25 (L=3)	OLS	0,1183	2,63 ***			-0,0531	-0,21			0,05	165
Talentum and OMX25	VEC	-0,1453	-2,60 ***			-0,0290	-0,90				166
Alma Media	OLS							0,2353	**3,04** ***	0,09	93
Alma Media (L=1)	OLS							0,2117	**2,70** ***	0,07	92
Alma Media (L=2)	OLS							0,2472	**3,18** ***	0,10	91
Alma Media (L=3)	OLS							0,2265	**2,88** ***	0,09	90
Alma Media	VEC							-0,2755	**-2,64** ***		91
Alma Media and OMX25	OLS	0,0209	0,14					0,2168	1,44	0,09	93
Alma Media and OMX25 (L=1)	OLS	0,0619	0,42					0,1573	1,04	0,08	92
Alma Media and OMX25 (L=2)	OLS	-0,0634	-0,43					0,3030	2,02 **	0,10	91
Alma Media and OMX25 (L=3)	OLS	-0,0128	-0,09					0,2377	1,56	0,09	90
Alma Media and OMX25	VEC	-0,2645	-1,35					0,0230	0,11		91
Portfolio (S=2)	OLS	0,0185	0,34	0,1363	**2,80** ***	-0,0367	-0,15			0,09	168
Portfolio (S=2, L=1)	OLS	0,0086	0,16	0,1474	**3,01** ***	-0,0103	-0,42			0,09	167
Portfolio (S=2, L=2)	OLS	0,0260	0,46	0,1251	2,53 **	-0,0052	-0,21			0,08	166
Portfolio (S=2, L=3)	OLS	0,0408	0,71	0,1070	2,15 **	-0,0074	-0,29			0,01	165
Portfolio (S=2)	VEC	-0,0029	-0,04	-0,1767	**-3,09** ***	-0,0248	-0,88				166
Portfolio (S=3)	OLS	-0,0477	-0,33	-0,1923	-1,46	0,5989	**2,99** ***	0,1776	1,17	0,20	93
Portfolio (S=3, L=1)	OLS	-0,0260	-0,17	-0,0786	-0,58	0,4416	2,15 **	0,0860	0,55	0,16	92
Portfolio (S=3, L=2)	OLS	-0,1179	-0,81	-0,2493	-1,86	0,6392	**3,19** ***	0,2918	1,90 *	0,21	91
Portfolio (S=3, L=3)	OLS	-0,0739	-0,48	-0,1228	-0,87	0,4173	1,99 **	0,2051	1,28	0,14	90
Portfolio (S=3)	VEC	-0,2921	-1,90 *	0,0662	0,46	-0,5033	-2,46 **	0,2586	1,52		91

*, **, and *** signal 10, 5, and 1 % statistical significance, respectively.

The OLS tests indicate high statistical significance for the single short positions of Sanoma and Alma Media, with t-stat values ranging from 2.70 to 4.09 between different lag times. Talentum, however, is not significant, its t-stats falling between 0.77 and 1.06. The VEC results for all three companies rival OLS results, with only Alma Media having higher statistical significance via OLS. When a market position for OMX25 is included, Sanoma remains the only significantly associated company in the sample. The t-stat values range from 2.15 to 3.00. The VEC results show higher significance, a t-stat value of -3.05. For the portfolios with two individual share positions, again only Sanoma shows highly meaningful association with Otavamedia's media sales cash flow. The VEC test provides highest significance with a t-stat value of -3.09. The portfolio consisting of three individual shares and a market position is the lone case where Sanoma is not proven statistically significant. Meanwhile Talentum shows the top t-stat value of 3.19 in the OLS test lagged by two months.

The slightly demoralizing statistical results presented above are in this case left to serve their own purpose. The objective of this thesis is not to prove statistical significance, but to discover actual monetary value for the proposed risk management method.

Next the hedge ratios' performance in hedging Otavamedia's media sales cash flow is put to test. Each portfolio presented in Table VII is examined for three hedging strategies: a simple hedge, a hedge that is only active for months of negative expected media sales growth, and a speculative strategy where the positions are reversed for months of positive expected growth. Three adjustment periods for each strategy are also inspected: a constant model where the hedge ratios are not changed throughout the period, a monthly adjusted method, and a quarterly adjusted method. Section 5.2 summarizes the results for the total of 360 portfolios tested for hedging, and the results are further expanded in sections 5.3 through 5.5.

5.2 Portfolio analysis results

This section covers the results of the portfolio analysis for the 360 individual hedge portfolios tested. The in depth analysis presented in subsequent sections will specifically list the results of regression tests ran in a 3 by 3 dimension where the x-axis has hedging strategies and y-axis portfolio adjustment intervals. The strategies are: a simple hedge that is active throughout the test period, one that is active only for time periods of negative media sales cash flow

growth, and lastly the strategy where the position is alternated to a speculative one when media sales cash flow is expected to grow. The adjustment intervals are constant and unchanged hedge ratios, monthly adjusted ratios, and finally quarterly adjusted hedge ratios. Two regression models, the OLS and VEC, are tested against four portfolio variations: a single short position, a short position and long market position, a portfolio of two shorts and market long, and the portfolio with three shorts and a long market position. For the OLS regressions monthly lags from 0 to 3 are also inspected, in order to determine whether the effect of media sales cash flow is delayed due to public' companies strict financial reporting schedules. Tables detailing all test results in each category are listed in the appendices in matching order.

The OLS derived hedge ratios for the three short positions and a long market position perform best in all test categories. In six categories out of nine the portfolio with no lag reports the highest added cash flow over Otavamedia's media sales. The greatest excess cash flow overall (1.32 %) is shown for a monthly adjusted, OLS derived, hedge which is active for all time periods. The standard deviations of portfolios compared to that of Otavamedia's media sales cash flow are mixed. For example for the best performing portfolios in each category the standard deviation changes vary between -4.76 % and +1.32 %. In practice the volatility reduction in cash flow is of less importance to Otavamedia than the average value of cash flow per se. Liquidity of the company is not at risk in any case, so the focal point is rather the cash flow amassed annually.

The portfolio with the highest added cash flow actually has a higher standard deviation than the benchmark, resulting in a partial dismissal of H2. The hypothesis can only partially be accepted in terms of effect on cash flow improvement and volatility reduction. The strategy of hedging only when media sales cash flow is expecting negative growth is inferior to a simple hedge, leading to the complete dismissal of H3. Also the speculative swap performs far worse than the simple hedge, prompting the rejection of H4. The best results in each category are detailed in table VIII.

Table VIII
Strongest Performing Portfolios By Hedge Strategy And Adjustment Interval

The best cash flow generating regression models, portfolio contents and their annual added cash flow over Otavamedia's media sales. In parentheses is the percentage standard deviation change. Annual added cash flow is in percentages. OLS is ordinary least squares regression. L denotes data lag in months. Constant refers to a position where hedge ratios remain constant. Monthly is monthly adjusted portfolios. Quarterly is quarterly adjusted portfolios. Simple hedge is a position active for all time periods. Only negative is a position active only for time periods of negative media sales cash flow growth. Speculative is active hedging for negative time periods and speculating the opposite for time periods of positive media sales cash flow growth.

	Simple hedge	Only negative	Speculative
Constant	OLS S=3, L=2 **(-4.76 %)** 0.90 %	OLS, S=3, L=0 (+0.59 %) 0.55 %	OLS, S=3, L=1 (-2.30 %) 0.41 %
Monthly	OLS S=3, L=0 (+1.19 %) **1.32 %**	OLS, S=3, L=0 (+0.67 %) 0.87 %	OLS, S=3, L=0 (+1.03 %) 0.42 %
Quarterly	OLS S=3, L=0 (+0.68 %) 1.06 %	OLS, S=3, L=0 (+0.43 %) 0.65 %	OLS, S=3, L=1 (-1.94 %) 0.42 %

Out of all the tested security combinations, the portfolios consisting of three short positions and a long market position are superior in all cases. The OLS portfolios consistently outperform the VEC results; the top OLS derived portfolio's added cash flow is 1.32 % annually, whereas for the VEC model it remains at 1.08 %. The hedging strategies put in order; the simple hedge where the position is active for all time periods shows highest added cash flow, and also the highest reduction in volatility.

The single year with the highest added cash flow is found in the test for specific years of media market turmoil. In 2008 when the media sales cash flow of Otavamedia decreased by 4.9 % year on year, the 3 short position OLS portfolio returned a 4.58 % improvement in cash flow, or in monetary terms approximately a million Euros. This effect would have covered the whole loss in media sales and more.

Next, more specific results are categorized by each hedging strategy and portfolio adjustment interval in sections 5.2.1 through 5.2.6. Each of the hedging strategy subcategories presents the best performing portfolios for each portfolio type and portfolio adjustment interval, within

the respective hedging strategy. The subcategories of each portfolio adjustment interval summarize the findings of said hedge ratio refreshment cycle.

5.2.1 A simple hedging strategy

This section presents the performance of the simple hedge portfolios built on the hedge ratios derived from OLS and VEC regressions. The results are displayed in the order of portfolio adjustment period from constant to monthly and then quarterly. Best results in terms of lowered volatility are found for an OLS derived, 3 months lagged, single short position on Alma Media, -3.64 % in annual terms. The highest additional cash flow of 1.32 % is reported by an OLS derived portfolio of three short positions and a long market position. These results along with the best of each other combination of portfolio type and adjustment interval are reported in table IX.

Table IX

Best Performing Simple Hedge Portfolios by Adjustment Intervals And Portfolio Types

The best cash flow generating regression models, portfolio contents and their annual added cash flow over Otavamedia's media sales. Hedges are active for all time periods. In parentheses is the percentage standard deviation change. Annual added cash flow is in percentages. OLS is ordinary least squares regression. VEC is vector error correcting regression. L denotes data lag in months. S denotes number of short positions in portfolio. Constant refers to a position where hedge ratios remain constant. Monthly is monthly adjusted portfolios. Quarterly is quarterly adjusted portfolios. Single short stands for portfolio with one short position. Short and market refers to a portfolio with one short position and long market position. Portfolios of two short positions include Sanoma, Talentum and a long market position. Portfolios of three short positions include Sanoma, Talentum, Alma Media, and a long market position.

	Single short	Short and market	Portfolio, S=2	Portfolio, S=3
Constant	OLS Alma Media, L=3	OLS Alma Media, L=2	VEC	OLS
	(-3.64 %)	(-2.96 %)	(+0.23 %)	(+0.52 %)
	0.12 %	0.20 %	0.05 %	0,84 %
Monthly	VEC Alma Media	OLS Alma Media	VEC	OLS
	(-1.77 %)	(-2.17 %)	(+0.46 %)	(+1.19 %)
	0.23 %	0.18 %	0.18 %	**1,32 %**
Quarterly	VEC Alma Media	OLS Alma	VEC	OLS
	(-1.79 %)	(-2.19 %)	(+0.20 %)	(+0.68 %)
	0.09 %	0.07 %	0.09 %	1,06 %

Single short position hedges are undeniably futile, the highest annual cash flow improvement being 0.23 %. The three month lagged single short on Alma Media provides a meaningful 3.64 % reduction in cash flow volatility, but fails to deliver notable added cash flow. The results are equally miniscule for a portfolio of one short position and a long market position, where best improvements in cash flow remain at 0.20 %. Portfolios with two short positions, Sanoma Corporation and Talentum Corporation, also report immaterial cash flow results even though the sample size is greater than for the larger portfolio – the highest addition being 0.18 %. As mentioned earlier, the best results are found for a portfolio of three short positions and a long market position, 1.32 % improved annual cash flow.

5.2.2 Hedging only negative months

This section presents the results specifically for a second perspective where the hedge is only active for time periods of negative media sales cash flow growth. This is inspired by the fact that Otavamedia's media sales cash flow is quite accurately known a month in advance, suggesting that if economically beneficial, the hedge could be canceled for months where media sales perform positively and the hedge is assumed to be less beneficial. For months when the hedge is not active, portfolio cash flows equal media sales cash flow. Results for different portfolio adjustment intervals and portfolio types are presented in table XI.

Table X
Best Performing Negative-only Portfolios By Adjustment Intervals And Portfolio Types
The best cash flow generating regression models, portfolio contents and their annual added cash flow over Otavamedia's media sales. Hedges are active only for time periods of negative expected media sales cash flow growth. In parentheses is the percentage standard deviation change. Annual added cash flow is in percentages. OLS is ordinary least squares regression. VEC is vector error correcting regression. L denotes data lag in months. S denotes number of short positions in portfolio. Constant refers to a position where hedge ratios remain constant. Monthly is monthly adjusted portfolios. Quarterly is quarterly adjusted portfolios. Single short stands for portfolio with one short position. Short and market refers to a portfolio with one short position and long market position. Portfolios of two short positions include Sanoma, Talentum and a long market position. Portfolios of three short positions include Sanoma, Talentum, Alma Media, and a long market position.

	Single short	Short and market	Portfolio, S=2	Portfolio, S=3
Constant	OLS Alma Media, L=1	OLS Alma Media, L=2	OLS, L=2	OLS
	(-3.31 %)	(-3.21 %)	(-0.08 %)	(+0.59 %)
	0.22 %	0.30 %	0.04 %	0.55 %
Monthly	VEC Alma Media	OLS Alma Media	VEC	OLS
	(-1.81 %)	(-2.43 %)	(+0.06 %)	(+0.67 %)
	0.15 %	0.11 %	0.10 %	**0.87 %**
Quarterly	OLS Alma Media, L=1	OLS Talentum, L=3	VEC	OLS
	(-3.56 %)	(+0.13 %)	(-0.06 %)	(+0.43 %)
	0.08 %	0.07 %	0.05 %	0.65 %

Best results for added cash flow are again found in the monthly adjusted portfolios with OLS derived hedge ratios, only three out of the twelve categories are won by VEC derived portfolios. The best improvement in annual cash flow is 0.87 %, reported by an OLS derived portfolio of three short positions and a long market position. The highest reduction in cash flow volatility of -3.56 % is offered by an OLS derived, one month lagged, single short position in Alma Media.

5.2.3 Hedging with speculative swap

This section presents the results specifically for a speculative model where the hedge is active for negative time periods and reversed on positive time periods. For negative months the hedge portfolio has short positions on the individual shares and a long position on the market. During months of media sales cash flow growth, the individual share positions are long and the market position short. This method attempts to lower the vulnerability to media sales cash flow reductions but gain stronger benefit from its market-driven increases. Results for different portfolio adjustment intervals and portfolio types are presented in table XII.

Table XI
Best Performing Speculative Portfolios By Adjustment Intervals And Portfolio Type
The best cash flow generating regression models, portfolio contents and their annual added cash flow over Otavamedia's media sales. Hedges are active for time periods of negative expected media sales cash flow growth, and reversed for time periods of positive expected media sales cash flow growth. In parentheses is the percentage standard deviation change. Annual added cash flow is in percentages. OLS is ordinary least squares regression. VEC is vector error correcting regression. L denotes data lag in months. S denotes number of short positions in portfolio. Constant refers to a position where hedge ratios remain constant. Monthly is monthly adjusted portfolios. Quarterly is quarterly adjusted portfolios. Single short stands for portfolio with one short position. Short and market refers to a portfolio with one short position and long market position. Portfolios of two short positions include Sanoma, Talentum and a long market position. Portfolios of three short positions include Sanoma, Talentum, Alma Media, and a long market position.

	Single short	Short and market	Portfolio, S=2	Portfolio, S=3
Constant	OLS Alma Media, L=1	OLS Alma Media, L=2	OLS, L=2	OLS, L=1
	(-3.48 %)	(-2.26 %)	(-0.15 %)	(-2.30 %)
	0.38 %	0.40 %	0.04 %	0.41 %
Monthly	OLS Alma Media, L=1	OLS Alma Media, L=2	OLS, L=1	OLS
	(-3.49 %)	(-2.93 %)	(+0.39 %)	(+1.03 %)
	0.21 %	0.18 %	0.05 %	0.42 %
Quarterly	OLS Alma Media, L=1	OLS Alma Media, L=1	OLS, L=1	OLS, L=1
	(-3.60 %)	**(-3.91 %)**	(+0.55 %)	(-1.94 %)
	0.20 %	0.09 %	0.05 %	**0.42%**

The best results for added cash flow for the negative-month only strategy are again found in the OLS derived portfolio of three short positions. The improvement in cash flow is a mediocre 0.42 % found with the quarterly adjusted portfolio, lagged by one month. The VEC derived portfolios are not present in any subcategory, OLS hedge ratios proved superior in all cases. The strongest effect in cash flow volatility is reported by an OLS derived, one month lagged short position in Alma Media and a long market position in OMX25. Annual cash flow volatility is reduced by 3.91 %.

5.2.4 Constant ratio hedge positions

The constant ratios which are not altered at any point in time proved the best at lowering Otavamedia's cash flow volatility. The highest reduction of -4.76 % is found with the OLS derived, two month lagged, simple hedge portfolio of three short positions and a long position. The same portfolio also increased annual cash flows by 0.90 %. The use of constant

ratios would also yield significant advantages in practical use. There would be fewer transactions, which lead to less direct transaction costs and less costs related to bid-ask spreads. Also fewer resources would be spent on risk management activities as the positions would remain constant.

No significant benefit in the outcomes of the tests can be seen from the change of hedging strategy. Neither the negative-month only nor the speculative strategies bring forth superior results, but would in fact add expenses via the increased number of transactions.

5.2.5 Monthly adjusted hedge positions

The monthly adjusted portfolios are based on the assumption that it is beneficial to rearrange the hedge ratios frequently, to maintain the correct ratios with regard to expected levels of media sales cash flow. Monthly adjusted hedge ratios reported the highest increase in annual cash flow. The OLS derived portfolio of three short positions and a long market position resulted in an annual average increase of 1.32 % in Otavamedia's media sales cash flow. The strategy of the best portfolio is the one labeled simple hedge, referring to a straightforward approach of holding the position active at all times. The volatility effect of the portfolio is actually positive at +1.19 % in average.

The monthly adjusting of hedge ratios requires an increased number of transactions, with direct implications on risk management efficiency. Each transaction adds unavoidable transaction costs along with indirect costs related to bid-ask spreads and time spent actively managing the positions.

5.2.6 Quarterly adjusted hedge positions

The quarterly adjustment interval refers to the positions being corrected precisely with regard to the hedge ratios once every three months. This method proved worst of all three, having lower volatility reducing capabilities than constant hedge ratio positions, and less of an improvement on cash flows than the monthly adjusted portfolios.

The best cash flow addition of 1.06 % was reported by a simple OLS derived portfolio of three short positions and a long market position. The same portfolio increased volatility by 0.68 %. The strongest reduction in volatility, -1.94 %, was found in a speculative OLS derived, one month lagged portfolio of three short positions and a long market position. The increase in average annual cash flow was 0.42 %.

5.3 Results for specific time periods

This section takes a look at hedge portfolio performance during specific years of media market turmoil. The years 2001, 2008, 2009 and 2012 are examined individually for both portfolios, with both the OLS and VEC derived hedge ratios. The chosen years all had negative media sales cash flow growth, which should by the assumptions of this paper be reflected in competing media companies' share prices and thus the hedge portfolios. For the year 2001 only portfolios with 2 short positions are included due to Alma Media not being publicly listed. Table XXI summarizes the results.

Table XII
Portfolio Performance Under Specific Years Of Media Market Turmoil

Years 2001, 2008, 2009 and 2012 are specifically examined for hedge portfolio performance over a 12 month period where media sales cash flows have performed poorly. %-change in media sales represents the annual growth of Otavamedia's media sales cash flow in percentages. OLS is the ordinary least squares regression derived portfolio of short positions and long market position. VEC is the vector error correcting model derived portfolio of short positions and long market position. S in parentheses denotes the amount of individual stock short positions. Results are presented in improvements in annual cash flow over Otavamedia's media sales.

Year	%-change in media sales	OLS (S=2)	OLS (S=3)	VEC (S=2)	VEC (S=3)
2001	-7,1	0,11 %		0,23 %	
2008	-4,9	0,74 %	4,58 %	1,16 %	2,76 %
2009	-19,1	-0,41 %	-0,39 %	-0,54 %	0,13 %
2012	-2,7	0,41 %	2,73 %	0,58 %	2,39 %

Unexpectedly and disappointingly the results for portfolio performance under specific years of media market turmoil are not univocally excellent. The year 2001 which witnessed a 7.1 % decline in media sales cash flow year over year, only resulted in a 0.23 % cash flow improvement at best. The performance of each portfolio is also inconsistent: VEC portfolios outperform OLS portfolios in years 2001 and 2009, but fall behind in 2008 and 2012. The

largest effect is witnessed in 2008 where the strongest portfolio of the study, the OLS portfolio with three short positions and long market position, returned a 4.58 % premium over Otavamedia's media sales cash flow for the year.

5.4 Economic significance

This section inspects the economic significance of the results. While the reported improvements in annual cash flows and standard deviations may disappoint statistically, the economic benefits to Otavamedia may still be significant. Topics to consider include the significance of additional cash flows, the return on invested capital, the opportunity costs of capital employed, and the estimated break-even point of hedging.

The reported improvements in annual cash flows were not particularly high in percentages, but that does not necessarily mean the effect in monetary terms would not be meaningful. The 1.32 % improvement in cash flow over the average annual media sales cash flow of 20,7 million Euros results in an annual amount of 273 156 Euros. This amount would naturally bare some expenses due to bid-ask spreads and transaction costs, but nevertheless it can be expected to have a high profit margin. Whether this can be considered significant or not is down to each company's own interpretation.

For the single best year, 2008, the improvement in cash flow was approximately a million Euros. This underlines the problem of the hedging method in annual terms – many of the inspected years returned marginal or negative premiums. Businesses would have difficulty in accepting negative cash flow effects in annual terms to benefit only marginally in the long term. However, closely held private companies may be an exception to this assumption.

The next section concludes the thesis by summarizing the motivation from the study, how the tests were carried out, and what the results were. The conclusion begins with the synopsis of the study, followed by the key findings, discussion and lastly the suggestion for future research.

6. Conclusions

This section concludes the study with synopsis, key findings, discussion, and suggestions for future research. First the thesis is synopsized from motivation to testing methods, followed by the key findings, of which the most important is that the hedging methods suggested did not prove all that successful in Otavamedia's case. Next the implications of the study are discussed, revolving around possible limitations omitted from this study, which could have significant impact on the practical use of the hedging strategy. Then the suggestions for future research outline the directions the paper could be expanded. The study hinted that the hedging strategies might prove economically viable, and the question is which markets and segments could have companies facing similar risk characteristics not catered by the financial services industry.

6.1 Synopsis

The objective of this thesis was to discover whether Otavamedia, a Finnish media company, could utilize its' publicly listed competitors' shares as a tool of risk management for its highly important media sales cash flow. The advantage it has in this respect is the advance knowledge of media advertising growth, which is generally found to be vastly cyclical and volatile. This information would by the assumptions of this paper, provide the company with a predictor on the future growth of its competing companies' share returns. The study proposed that a combination of securities could then be found which would offset a significant amount of Otavamedia's media sales cash flow volatility and deliver additional cash flows. Securities included in the study were the media corporations Sanoma, Talentum and Alma Media, the stock market indexes OMXH and OMX25. Control variables used to rule out external influence of key factors were the 12-month Euribor rate, the Finnish consumer price index, and the global price wood pulp price index. The testing process was designed so that it would not be overly focused, but rather a wide set of parameters were included to broaden the scope. Four different portfolio variations were inspected: a single short position, a short position coupled with a long market position, a portfolio of two short positions and a long market position, and finally a portfolio of three short positions and a long market position. Three portfolio adjustment intervals were also examined: a constant portfolio where position allocations are set in the beginning and not altered throughout the test period, a

monthly adjustment interval where the portfolio allocations are readjusted every month to fit the current level of media sales cash flow, and a quarterly adjustment interval where the allocations are rebalanced once in three months. Three variations of hedging strategies were tested: a simple hedge where positions are active for all time periods, a negative-month only – strategy where the positions are active only for months of negative expected cash flow growth, and a speculative strategy where the positions are reversed for months of positive expected cash flow growth. The hedge ratios were derived using two separate regression models, the ordinary least squares model and the vector error correcting model. For the OLS model, three data lag times from 1 to 3 months were additionally inspected to find out whether the assumed effect of media sales cash flow growth on share prices is delayed. All the aforementioned factors were all cross-inspected, resulting in a total portfolio count of 360. The results of the tests and the significance of those results are presented next in key findings.

6.2 Key findings

The statistical results of the study fell short from expectations, and the reported significance levels suggested weak economic performance as well. However, the hypotheses were partially confirmed: the share price changes Sanoma Corporation, Talentum Corporation, and Alma Media are indeed partially but significantly correlated with Otavamedia's media sales cash flow and the constructed hedge portfolios did to some extent offer improvements to annual cash flow and lowered volatility.

The highest annual improvement in cash flow over the study period was found with the OLS derived portfolio consisting of short positions in all three target companies and a long market position in OMX25 – an annual addition of 1.32 % or 273 156 Euros. However, the further proposed, more tailored hedging strategies proved to be even less beneficial. Activating the hedge only for time periods of negative sales growth was not found effective, and neither was the strategy of reversing the position for positive sales growth time periods. The strongest effect on volatility, -4.76 %, was found with the simple hedge, OLS derived portfolio of three short positions, lagged by two months.

For specific years of media market turmoil, the hedging strategies provided improved results. For two of the years reviewed, the additional cash flow exceeded 2 % and for 2008 it reached

the maximum of 4.58 %. These figures are grand in comparison to the average cash flow improvements of less than 1 % from the whole period under review, but remain modest when evaluated with regard to the annual declines in media sales cash flow during those same years. The cash flow effect in 2008 amounted to approximately a million Euros, fully covering the loss in media sales cash flow and more.

Next the discussion section considers a number of further limitations to the application of the results.

6.3 Discussion

There are a number of limitations to the practical implementation of the proposed hedging strategies deliberately omitted from this thesis. A large set of variables with possible limiting effects might derail the study for the wrong reasons. It is easier to include omitted variables later and test their effect on the outcome once an effect has already been confirmed for a smaller sample; nevertheless it is crucial to distinguish the effect of including or omitting variables.

The widespread tightening of short position regulation poses a threat for the risk management model, as it wholly relies on public competitors having similar risk characteristics and the short selling being a key element of assuming a contrary position. Even if the main underlying concern of regulators is to limit the financial distress caused to companies and their shareholders due to excessive short selling, smaller positions with less predatory motives are most certainly also influenced by such legislative changes. As a curiosity on US legislation prohibiting efficient markets, onion futures have not been traded since 1958 upon protest by farmers after prices collapsed. The recent bill, mentioned in the introduction section, which banned box office futures, also contains the same ban on onion contracts.

Bid and ask spreads may prove more significant than expected. If the companies targeted for short selling are not actively traded, or in other words their share is illiquid, the price difference of bid and ask prices may be substantial. In this regard both the seller and buyer of such securities are affected by the spread, limiting the possible outcomes of their trades.

Transaction costs are another factor limiting the economic outcome of the hedging strategies examined in this thesis. They are directly linked to the volume of securities traded and the adjustment period of the portfolios, as each transaction itself brings forth expenses. These costs are generally in relation to the total value bought or sold, and may prove significant if the transactions entail more difficultly obtained securities or if the adjustment portfolios and transaction volumes lead to an excessive amount of trades.

The political risk of short selling competitors who to some extent are also collaborators on industry-wide projects and share similar interests in many ways, may be considered hostile by said company. As witnessed by academic literature, many times public companies have share price based incentive plans for managers and such short selling would naturally directly affect those benefits. The political risk however, has more to do with how the company itself is seen in the market place. A company thought of as an unfriendly contributor to the industry may suffer drastic consequences if the image becomes commonplace and reaches its clients affecting its sales.

6.4 Concerning practical adaptation

In continuation to the practical limitations introduced in the previous chapter, this chapter further discusses the possibilities and shortcomings of practical adaptation. What factors affect the profitability of establishing such risk management activities, and how exactly would the hedging be implemented if so was decided.

The main concern with media sales cash flow fluctuation is the high impact it has on free cash flow and ultimately the amount available for distribution to shareholders. The lowered volatility of media sales cash flow is thus in the interest of Otavamedia's shareholders, and increasing the cash flow even more advantageous. A series of months with negative cash flow growth would severely influence shareholders' possibilities of paying out dividends.

The practical adaptation of a risk management model proposed by this thesis would incur multiple direct and indirect costs. First the different expenses for a monthly adjusted portfolio of four positions are described, and then each of them is given estimates of annually incurred

costs. Later the whole equation is examined through an approximated income statement for the best performing portfolio of the study.

First of all the setting up of a risk management program requires resources – either in-house work hours or alternatively if outsourced, the services of firm in the financial services industry. The amount of time needed to manage the positions from within Otavamedia is estimated at 10 hours monthly, or 120 hours per year. The cost of an average hour is estimated at 30 Euros, resulting in an annual cost of 3 600 Euros. The outsourced service provider is seen as a less likely choice, due to the strict financial control present within the case company. Outsourced portfolio management costs are estimated at 500 Euros monthly, 6 000 Euros annually.

Costs related to bid-ask spreads are incurred if the shares traded are illiquid and therefore there is a gap between the offer and asking prices of shares. For Sanoma Corporation and the OMX 25 index exchange-traded fund this risk is negligible, for Alma Media the spread is around 2 %, and for Talentum approximately 5 %. These costs are experienced for each transaction dealing with said shares. The direct transaction costs are typically around 0.10 % of transaction value. For the sake of estimation this cost is assumed to hold regardless of total trading volume.

The long market position included in the hedge portfolios requires capital in the amount of its hedge ratio times each months' expected media sales cash flow volume. This amount of capital bears the opportunity cost of investing it elsewhere, for Otavamedia this cost is equivalent to the rate used for internal profitability calculations, which is 8 %.

The short positions in Sanoma, Talentum, and Alma Media, require the lending of said shares in relation to their hedge ratios and Otavamedia's media sales cash flow. In order to lend these shares, the lenders will require collateral either in terms of a deposit or an asset deemed liquid. The collateral involved is marginal for the case company, which has a very strong financial position and holds a triple-A credit rating.

Table XIII presents the estimated income statement for the highest additional cash flow providing portfolio of the study.

Table XIII
Estimated Income Statement For Best Performing Portfolio

The estimated income statement for the best performing portfolio, the simple OLS derived, monthly adjusted portfolio consisting of short positions in Sanoma, Talentum and Alma Media, and a long position in the market index OMX25. All types of cost and cash flow influx are in annual terms. Transaction fees refer to direct costs related to transactions, approximated at 2 % of transaction value. Bid-ask spreads are costs incurred from transactions due to the gap between asking and offering price. Alma Media incurs 2 % bid-ask spread costs and Talentum 5 %. The opportunity cost of capital is 8 %. Fixed costs refer to 10 hours of work per month in-house spent to manage portfolios.

Type of cost	Euros
Cash flow influx	273 156
Transaction fees	-35 057
Bid-ask spreads	-57 763
Opportunity cost of capital *(Capital required 82 242)*	-6 579
Fixed costs	-3 600
Net after costs	170 157

The net effect to cash flow after expenses would be approximately 170 000 Euros annually. While the figure itself is far from insignificant, in relation to the net result of the Otava group, which Otavamedia is a part of, the amount can be considered modest. In theory all positive net present value projects should be undertaken, but the question is whether to begin operating financial portfolio management in-house. Perhaps the solution would indeed be to specifically guide a financial services company to provide the full service, with the knowledge provided by Otavamedia.

6.5 Suggestions for future research

Even though the effects were minor overall, the thesis does still indicate promise for a new method of risk management designed to fit private companies focused in a specific industry. Standard deviations were for the most part lowered by the hedge, and in many cases positive, yet meager, annual return premiums were also confirmed.

The Finnish media market and its' publicly listed companies is narrow to say the least. With only three securities as the possible short position instrument, not much can be concluded of

the suggested hedging strategy itself. What can be stated is that for Otavamedia the recommendation is not to pursue such risk management with these portfolios. More tests could be done with for example European media companies and perhaps even other public companies in the Finnish market. With a sample of over a hundred companies, surprising outcomes might show that could not be expected beforehand.

Further research on the topic could be directed outside the Finnish market, for example to the U.S., where a much larger sample size could possibly reveal interesting results. The opportunities for a privately held American media company are vastly different from Finland, which would undoubtedly be reflected in their results, too. Other industries where a risk characteristic is shared by all companies and where financial services do not provide risk management for said risk, should be identified. These industries would then provide secondary conclusions to the hedging strategy. The 1991 study by Strong failed to note the hedging efforts done by oil companies themselves, when he attempted to construct a hedge for oil price movements by a portfolio of oil companies. It is imperative for such hedges that the said exposure be unhedged and fully reflected in the public companies' share prices.

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Appendices

Appendix 1
OLS Derived, Constant Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,08	463,18	724,49	2 800,97	0,04 %
SANOMA (L=1)	167	1 728,96	**461,85**	741,59	2 840,32	0,04 %
SANOMA (L=2)	166	1 728,60	463,34	744,88	2 805,57	0,03 %
SANOMA (L=3)	165	1 727,31	464,94	730,00	2 809,09	0,02 %
TALENTUM	168	1 724,61	463,48	730,27	2 803,31	0,01 %
TALENTUM (L=1)	167	1 728,39	**461,83**	731,77	2 804,67	0,01 %
TALENTUM (L=2)	166	1 728,21	**462,70**	732,30	2 803,95	0,01 %
TALENTUM (L=3)	165	1 727,06	463,79	730,48	2 804,53	0,01 %
ALMA MEDIA	93	1 730,59	**456,05**	800,93	2 842,96	0,07 %
ALMA MEDIA (L=1)	92	1 737,39	**449,71**	889,24	2 802,54	0,07 %
ALMA MEDIA (L=2)	91	1 737,49	**443,17**	936,68	2 779,27	0,09 %
ALMA MEDIA (L=3)	90	1 735,98	**446,01**	881,06	2 796,97	0,12 %

Appendix 2
VEC Derived, Constant Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in all periods. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,21	463,31	723,31	2 800,32	0,04 %
TALENTUM	168	1 724,75	464,07	730,52	2 802,66	0,02 %
ALMA MEDIA	93	1 730,80	**457,77**	781,07	2 849,63	0,09 %

Appendix 3
OLS Derived, Constant Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,11	463,19	722,46	2 802,83	0,04 %
SANOMA (L=1)	167	1 728,97	**461,84**	741,15	2 839,03	0,04 %
SANOMA (L=2)	166	1 728,64	463,13	742,42	2 802,14	0,03 %
SANOMA (L=3)	165	1 727,38	464,11	737,80	2 810,47	0,03 %
TALENTUM	168	1 724,99	463,72	713,34	2 815,40	0,03 %
TALENTUM (L=1)	167	1 728,76	**461,78**	715,85	2 762,22	0,03 %
TALENTUM (L=2)	166	1 728,56	**462,62**	711,22	2 787,20	0,03 %
TALENTUM (L=3)	165	1 727,40	**462,26**	755,80	2 811,51	0,03 %
ALMA MEDIA	93	1 730,55	**454,88**	813,50	2 842,26	0,07 %
ALMA MEDIA (L=1)	92	1 737,36	**446,85**	898,41	2 777,19	0,06 %
ALMA MEDIA (L=2)	91	1 739,49	**449,16**	814,89	2 761,27	0,20 %
ALMA MEDIA (L=3)	90	1 736,10	**445,73**	880,10	2 797,52	0,12 %

Appendix 4
VEC Derived, Constant Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in all periods. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,25	463,33	722,03	2 801,27	0,05 %
TALENTUM	168	1 725,29	464,63	709,11	2 817,72	0,05 %
ALMA MEDIA	93	1 730,26	**446,36**	912,78	2 837,61	0,05 %

Appendix 5
OLS Derived, Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 743,87	465,29	786,23	2 830,32	0,84 %
PORTFOLIO (L=1)	92	1 743,93	**460,69**	882,41	2 875,24	0,44 %
PORTFOLIO (L=2)	91	1 751,60	**440,85**	874,01	2 754,65	0,90 %
PORTFOLIO (L=3)	90	1 744,72	**440,93**	875,90	2 839,29	0,62 %

Appendix 6
OLS Derived, Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 725,15	463,29	722,18	2 802,92	0,04 %
PORTFOLIO (L=1)	167	1 729,07	**461,92**	741,45	2 837,42	0,05 %
PORTFOLIO (L=2)	166	1 728,69	463,03	742,44	2 801,66	0,04 %
PORTFOLIO (L=3)	165	1 727,46	463,88	739,02	2 810,97	0,03 %

Appendix 7
VEC Derived, Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in all periods. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 725,37	463,94	723,17	2 799,92	0,05 %
PORTFOLIO (S=3)	93	1 740,45	466,02	753,81	2 834,30	0,64 %

Appendix 8
OLS Derived, Monthly Adjusted Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 726,26	463,62	726,51	2 798,60	0,10 %
SANOMA (L=1)	167	1 728,39	**461,62**	737,34	2 868,65	0,01 %
SANOMA (L=2)	166	1 728,29	464,10	741,35	2 806,79	0,01 %
SANOMA (L=3)	165	1 726,96	465,38	730,00	2 813,06	0,00 %
TALENTUM	168	1 725,41	463,81	730,27	2 801,13	0,05 %
TALENTUM (L=1)	167	1 728,40	**461,82**	731,78	2 806,77	0,01 %
TALENTUM (L=2)	166	1 727,95	**462,50**	732,32	2 803,79	-0,01 %
TALENTUM (L=3)	165	1 726,75	463,62	730,49	2 806,20	-0,01 %
ALMA MEDIA	93	1 732,75	**453,58**	872,29	2 840,82	0,20 %
ALMA MEDIA (L=1)	92	1 736,88	**447,04**	906,31	2 802,62	0,04 %
ALMA MEDIA (L=2)	91	1 734,61	**445,18**	933,10	2 780,63	-0,08 %
ALMA MEDIA (L=3)	90	1 732,92	**446,60**	903,15	2 797,35	-0,06 %

Appendix 9
VEC Derived, Monthly Adjusted Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 726,65	463,90	725,76	2 797,45	0,13 %
TALENTUM	168	1 726,30	464,78	730,52	2 798,42	0,11 %
ALMA MEDIA	93	1 733,33	**454,71**	864,64	2 847,12	0,23 %

Appendix 10
OLS Derived, Monthly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 726,19	463,74	725,60	2 800,62	0,10 %
SANOMA (L=1)	167	1 728,41	**461,63**	737,11	2 867,08	0,01 %
SANOMA (L=2)	166	1 728,47	463,79	738,45	2 803,25	0,03 %
SANOMA (L=3)	165	1 727,13	464,72	733,71	2 813,75	0,01 %
TALENTUM	168	1 724,85	464,84	722,08	2 815,24	0,02 %
TALENTUM (L=1)	167	1 729,31	**462,60**	723,59	2 763,17	0,06 %
TALENTUM (L=2)	166	1 729,10	**462,54**	721,19	2 787,27	0,06 %
TALENTUM (L=3)	165	1 727,47	463,05	742,34	2 811,87	0,03 %
ALMA MEDIA	93	1 732,38	**452,86**	877,29	2 840,01	0,18 %
ALMA MEDIA (L=1)	92	1 736,90	**445,53**	909,93	2 780,24	0,04 %
ALMA MEDIA (L=2)	91	1 735,36	**446,89**	902,61	2 764,26	-0,03 %
ALMA MEDIA (L=3)	90	1 732,93	**446,37**	902,82	2 797,82	-0,06 %

Appendix 11
VEC Derived, Monthly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 726,66	463,99	725,16	2 798,42	0,13 %
TALENTUM	168	1 726,00	466,40	720,22	2 815,08	0,09 %
ALMA MEDIA	93	1 728,48	**447,53**	931,49	2 833,93	-0,05 %

Appendix 12
OLS Derived, Monthly Adjusted Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 752,17	468,37	834,06	2 802,41	1,32 %
PORTFOLIO (L=1)	92	1 746,02	**460,99**	905,94	2 904,12	0,56 %
PORTFOLIO (L=2)	91	1 745,68	**448,69**	918,62	2 758,77	0,56 %
PORTFOLIO (L=3)	90	1 739,46	**444,47**	899,20	2 852,37	0,32 %

Appendix 13
OLS Derived, Monthly Adjusted Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 726,34	463,92	725,49	2 800,37	0,11 %
PORTFOLIO (L=1)	167	1 728,55	**461,77**	737,80	2 866,89	0,02 %
PORTFOLIO (L=2)	166	1 728,49	463,65	738,74	2 802,75	0,03 %
PORTFOLIO (L=3)	165	1 727,11	464,47	734,38	2 814,82	0,01 %

Appendix 14
VEC Derived, Monthly Adjusted Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 727,60	464,99	725,84	2 794,86	0,18 %
PORTFOLIO (S=3)	93	1 748,08	466,57	829,91	2 812,49	1,08 %

Appendix 15
OLS Derived, Quarterly Adjusted Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,46	463,00	721,93	2 799,90	0,06 %
SANOMA (L=1)	167	1 728,59	**461,72**	743,05	2 853,11	0,02 %
SANOMA (L=2)	166	1 728,68	463,91	744,63	2 806,12	0,04 %
SANOMA (L=3)	165	1 727,15	465,53	730,00	2 810,89	0,01 %
TALENTUM	168	1 724,85	463,46	730,59	2 801,56	0,02 %
TALENTUM (L=1)	167	1 728,44	**461,73**	733,93	2 806,35	0,01 %
TALENTUM (L=2)	166	1 728,14	**462,41**	735,11	2 803,82	0,01 %
TALENTUM (L=3)	165	1 727,00	463,67	731,07	2 805,87	0,01 %
ALMA MEDIA	93	1 730,65	453,50	817,32	2 833,81	0,08 %
ALMA MEDIA (L=1)	92	1 735,67	**447,30**	893,16	2 802,88	-0,03 %
ALMA MEDIA (L=2)	91	1 735,30	**444,28**	942,73	2 785,07	-0,04 %
ALMA MEDIA (L=3)	90	1 733,64	**446,78**	886,13	2 798,62	-0,02 %

Appendix 16
VEC Derived, Quarterly Adjusted Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,68	463,15	720,20	2 799,02	0,07 %
TALENTUM	168	1 725,20	464,05	731,15	2 799,26	0,04 %
ALMA MEDIA	93	1 730,88	**454,58**	800,26	2 838,92	0,09 %

Appendix 17

OLS Derived, Quarterly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,48	463,14	720,15	2 801,57	0,06 %
SANOMA (L=1)	167	1 728,61	**461,71**	743,04	2 851,84	0,02 %
SANOMA (L=2)	166	1 728,76	463,62	744,71	2 803,15	0,04 %
SANOMA (L=3)	165	1 727,40	464,67	737,58	2 811,60	0,03 %
TALENTUM	168	1 725,08	464,60	713,83	2 813,51	0,04 %
TALENTUM (L=1)	167	1 729,25	**462,31**	717,02	2 769,46	0,06 %
TALENTUM (L=2)	166	1 728,78	**462,57**	712,05	2 789,84	0,04 %
TALENTUM (L=3)	165	1 727,87	**462,53**	753,49	2 810,66	0,06 %
ALMA MEDIA	93	1 730,59	**452,76**	827,92	2 833,23	0,07 %
ALMA MEDIA (L=1)	92	1 736,10	**445,74**	900,92	2 783,94	-0,01 %
ALMA MEDIA (L=2)	91	1 735,33	**442,98**	946,97	2 773,09	-0,04 %
ALMA MEDIA (L=3)	90	1 733,68	**446,56**	885,26	2 799,02	-0,02 %

Appendix 18

VEC Derived, Quarterly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,71	463,24	718,99	2 799,84	0,07 %
TALENTUM	168	1 725,67	465,71	710,10	2 813,37	0,07 %
ALMA MEDIA	93	1 729,98	**447,03**	929,80	2 829,19	0,04 %

Appendix 19
OLS Derived, Quarterly Adjusted Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 747,59	466,04	748,37	2 802,04	1,06 %
PORTFOLIO (L=1)	92	1 745,35	**459,80**	864,80	2 885,96	0,52 %
PORTFOLIO (L=2)	91	1 750,57	**445,50**	857,44	2 766,28	0,84 %
PORTFOLIO (L=3)	90	1 742,99	**442,65**	878,09	2 844,52	0,52 %

Appendix 20
OLS Derived, Quarterly Adjusted Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 725,55	463,25	719,92	2 801,36	0,06 %
PORTFOLIO (L=1)	167	1 728,77	**461,79**	745,50	2 851,65	0,03 %
PORTFOLIO (L=2)	166	1 728,81	463,47	745,00	2 802,72	0,04 %
PORTFOLIO (L=3)	165	1 727,47	464,42	738,96	2 812,50	0,03 %

Appendix 21
VEC Derived, Quarterly Adjusted Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in all periods. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 726,07	463,83	720,41	2 796,82	0,09 %
PORTFOLIO (S=3)	93	1 743,34	464,93	736,40	2 809,74	0,81 %

Appendix 22
OLS Derived, Constant Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,01	462,93	730,00	2 800,97	0,03 %
SANOMA (L=1)	167	1 728,78	**462,73**	730,00	2 840,32	0,03 %
SANOMA (L=2)	166	1 728,71	**462,38**	730,00	2 805,57	0,04 %
SANOMA (L=3)	165	1 726,61	465,59	730,00	2 809,09	-0,02 %
TALENTUM	168	1 724,45	**462,85**	730,00	2 803,31	0,00 %
TALENTUM (L=1)	167	1 728,20	**461,57**	730,00	2 804,67	0,00 %
TALENTUM (L=2)	166	1 727,99	**462,76**	730,00	2 803,95	0,00 %
TALENTUM (L=3)	165	1 726,95	464,18	730,00	2 804,53	0,00 %
ALMA MEDIA	93	1 730,40	**453,37**	800,93	2 842,96	0,06 %
ALMA MEDIA (L=1)	92	1 740,10	**447,54**	889,24	2 802,54	0,22 %
ALMA MEDIA (L=2)	91	1 735,65	**444,79**	958,00	2 779,27	-0,02 %
ALMA MEDIA (L=3)	90	1 733,63	**450,08**	881,06	2 796,97	-0,02 %

Appendix 23
VEC Derived, Constant Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active only in negative months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,13	462,98	730,00	2 800,32	0,04 %
TALENTUM	168	1 724,43	**462,83**	730,00	2 802,66	0,00 %
ALMA MEDIA	93	1 730,58	**454,49**	781,07	2 849,63	0,07 %

Appendix 24
OLS Derived, Constant Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,97	463,14	730,00	2 802,83	0,03 %
SANOMA (L=1)	167	1 728,77	**462,71**	730,00	2 839,03	0,03 %
SANOMA (L=2)	166	1 728,71	**462,56**	730,00	2 802,14	0,04 %
SANOMA (L=3)	165	1 727,03	465,06	730,00	2 810,47	0,01 %
TALENTUM	168	1 724,41	464,69	730,00	2 815,40	0,00 %
TALENTUM (L=1)	167	1 727,84	**461,55**	730,00	2 762,22	-0,02 %
TALENTUM (L=2)	166	1 728,39	463,90	730,00	2 787,20	0,02 %
TALENTUM (L=3)	165	1 728,14	463,46	730,00	2 811,51	0,07 %
ALMA MEDIA	93	1 730,23	**452,85**	813,50	2 842,26	0,05 %
ALMA MEDIA (L=1)	92	1 738,52	**445,43**	898,41	2 777,19	0,13 %
ALMA MEDIA (L=2)	91	1 741,17	**448,02**	922,78	2 761,27	0,30 %
ALMA MEDIA (L=3)	90	1 733,76	**450,01**	880,10	2 797,52	-0,01 %

Appendix 25
VEC Derived, Constant Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active only in negative months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,12	463,09	730,00	2 801,27	0,04 %
TALENTUM	168	1 724,38	465,17	730,00	2 817,72	-0,01 %
ALMA MEDIA	93	1 728,37	**450,02**	949,23	2 837,61	-0,06 %

Appendix 26
OLS Derived, Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 738,80	465,59	786,23	2 830,32	0,55 %
PORTFOLIO (L=1)	92	1 743,68	**454,80**	894,54	2 875,24	0,43 %
PORTFOLIO (L=2)	91	1 740,31	**444,34**	958,00	2 754,65	0,25 %
PORTFOLIO (L=3)	90	1 735,67	**449,26**	875,90	2 839,29	0,10 %

Appendix 27
OLS Derived, Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 724,96	463,17	730,00	2 802,92	0,03 %
PORTFOLIO (L=1)	167	1 728,73	**462,64**	730,00	2 837,42	0,03 %
PORTFOLIO (L=2)	166	1 728,71	**462,52**	730,00	2 801,66	0,04 %
PORTFOLIO (L=3)	165	1 727,09	465,01	730,00	2 810,97	0,01 %

Appendix 28
VEC Derived, Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active only in negative months of media sales performance. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 725,10	463,00	730,00	2 799,92	0,04 %
PORTFOLIO (S=3)	93	1 737,41	463,74	753,81	2 834,30	0,47 %

Appendix 29
OLS Derived, Monthly Adjusted Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,61	**462,84**	730,00	2 798,60	0,07 %
SANOMA (L=1)	167	1 728,90	463,06	730,00	2 868,65	0,04 %
SANOMA (L=2)	166	1 728,18	**462,50**	730,00	2 806,79	0,01 %
SANOMA (L=3)	165	1 726,45	465,70	730,00	2 813,06	-0,03 %
TALENTUM	168	1 724,79	463,04	730,00	2 801,13	0,02 %
TALENTUM (L=1)	167	1 728,15	**461,46**	730,00	2 806,77	-0,01 %
TALENTUM (L=2)	166	1 727,77	**462,61**	730,00	2 803,79	-0,02 %
TALENTUM (L=3)	165	1 726,84	463,99	730,00	2 806,20	0,00 %
ALMA MEDIA	93	1 731,54	**451,99**	872,29	2 840,82	0,13 %
ALMA MEDIA (L=1)	92	1 738,38	**446,62**	906,31	2 802,62	0,12 %
ALMA MEDIA (L=2)	91	1 734,36	**445,69**	933,10	2 780,63	-0,09 %
ALMA MEDIA (L=3)	90	1 732,42	**448,43**	903,15	2 797,35	-0,09 %

Appendix 30
VEC Derived, Monthly Adjusted Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,86	462,91	730,00	2 797,45	0,08 %
TALENTUM	168	1 725,10	463,22	730,00	2 798,42	0,04 %
ALMA MEDIA	93	1 731,92	**452,78**	864,64	2 847,12	0,15 %

Appendix 31
OLS Derived, Monthly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,55	463,09	730,00	2 800,62	0,06 %
SANOMA (L=1)	167	1 728,89	463,04	730,00	2 867,08	0,04 %
SANOMA (L=2)	166	1 728,33	**462,62**	730,00	2 803,25	0,02 %
SANOMA (L=3)	165	1 726,86	465,30	730,00	2 813,75	0,00 %
TALENTUM	168	1 724,59	464,97	730,00	2 815,24	0,01 %
TALENTUM (L=1)	167	1 728,28	**461,89**	730,00	2 763,17	0,00 %
TALENTUM (L=2)	166	1 728,84	463,66	730,00	2 787,27	0,05 %
TALENTUM (L=3)	165	1 727,98	463,93	730,00	2 811,87	0,06 %
ALMA MEDIA	93	1 731,23	**451,64**	877,29	2 840,01	0,11 %
ALMA MEDIA (L=1)	92	1 737,40	**445,24**	909,93	2 780,24	0,07 %
ALMA MEDIA (L=2)	91	1 737,21	**447,01**	918,96	2 764,26	0,07 %
ALMA MEDIA (L=3)	90	1 732,46	**448,33**	902,82	2 797,82	-0,09 %

Appendix 32
VEC Derived, Monthly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,86	463,04	730,00	2 798,42	0,08 %
TALENTUM	168	1 724,99	465,71	730,00	2 815,08	0,03 %
ALMA MEDIA	93	1 727,85	**449,79**	931,49	2 833,93	-0,09 %

Appendix 33
OLS Derived, Monthly Adjusted Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 744,35	466,00	834,06	2 802,41	0,87 %
PORTFOLIO (L=1)	92	1 744,74	**456,14**	905,94	2 904,12	0,49 %
PORTFOLIO (L=2)	91	1 737,96	**448,09**	958,00	2 758,77	0,12 %
PORTFOLIO (L=3)	90	1 732,95	**448,91**	899,20	2 852,37	-0,06 %

Appendix 34
OLS Derived, Monthly Adjusted Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 725,61	463,15	730,00	2 800,37	0,07 %
PORTFOLIO (L=1)	167	1 728,85	462,95	730,00	2 866,89	0,03 %
PORTFOLIO (L=2)	166	1 728,29	**462,53**	730,00	2 802,75	0,01 %
PORTFOLIO (L=3)	165	1 726,88	465,21	730,00	2 814,82	0,00 %

Appendix 35
VEC Derived, Monthly Adjusted Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 726,19	463,16	730,00	2 794,86	0,10 %
PORTFOLIO (S=3)	93	1 742,14	463,19	829,91	2 812,49	0,74 %

Appendix 36
OLS Derived, Quarterly Adjusted Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,02	**462,43**	730,00	2 799,90	0,03 %
SANOMA (L=1)	167	1 728,94	463,45	730,00	2 853,11	0,04 %
SANOMA (L=2)	166	1 728,59	**462,47**	730,00	2 806,12	0,03 %
SANOMA (L=3)	165	1 726,65	466,51	730,00	2 810,89	-0,02 %
TALENTUM	168	1 724,64	462,99	730,00	2 801,56	0,01 %
TALENTUM (L=1)	167	1 728,18	**461,55**	730,00	2 806,35	0,00 %
TALENTUM (L=2)	166	1 727,92	**462,62**	730,00	2 803,82	-0,01 %
TALENTUM (L=3)	165	1 726,94	464,08	730,00	2 805,87	0,00 %
ALMA MEDIA	93	1 729,90	**451,94**	817,32	2 833,81	0,03 %
ALMA MEDIA (L=1)	92	1 737,70	**446,39**	893,16	2 802,88	0,08 %
ALMA MEDIA (L=2)	91	1 735,11	**445,47**	952,89	2 785,07	-0,05 %
ALMA MEDIA (L=3)	90	1 732,70	**449,64**	886,13	2 798,62	-0,07 %

Appendix 37
VEC Derived, Quarterly Adjusted Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,13	**462,41**	730,00	2 799,02	0,04 %
TALENTUM	168	1 724,81	463,11	730,00	2 799,26	0,02 %
ALMA MEDIA	93	1 730,00	**452,69**	800,26	2 838,92	0,04 %

Appendix 38
OLS Derived, Quarterly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,00	**462,68**	730,00	2 801,57	0,03 %
SANOMA (L=1)	167	1 728,93	463,42	730,00	2 851,84	0,04 %
SANOMA (L=2)	166	1 728,64	**462,59**	730,00	2 803,15	0,03 %
SANOMA (L=3)	165	1 727,04	465,83	730,00	2 811,60	0,01 %
TALENTUM	168	1 724,63	464,83	730,00	2 813,51	0,01 %
TALENTUM (L=1)	167	1 728,21	**461,48**	730,00	2 769,46	0,00 %
TALENTUM (L=2)	166	1 728,56	463,67	730,00	2 789,84	0,03 %
TALENTUM (L=3)	165	1 728,07	463,50	730,00	2 810,66	0,07 %
ALMA MEDIA	93	1 729,79	**451,58**	827,92	2 833,23	0,03 %
ALMA MEDIA (L=1)	92	1 736,96	**445,10**	900,92	2 783,94	0,04 %
ALMA MEDIA (L=2)	91	1 735,10	**444,80**	956,39	2 773,09	-0,05 %
ALMA MEDIA (L=3)	90	1 732,75	**449,57**	885,26	2 799,02	-0,07 %

Appendix 39
VEC Derived, Quarterly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,14	**462,54**	730,00	2 799,84	0,04 %
TALENTUM	168	1 724,87	465,48	730,00	2 813,37	0,02 %
ALMA MEDIA	93	1 728,50	**449,42**	942,31	2 829,19	-0,05 %

Appendix 40
OLS Derived, Quarterly Adjusted Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 740,56	464,89	748,37	2 802,04	0,65 %
PORTFOLIO (L=1)	92	1 744,44	**455,16**	894,13	2 885,96	0,47 %
PORTFOLIO (L=2)	91	1 741,16	**447,45**	958,00	2 766,28	0,30 %
PORTFOLIO (L=3)	90	1 734,62	**450,11**	878,09	2 844,52	0,04 %

Appendix 41
OLS Derived, Quarterly Adjusted Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 725,03	**462,73**	730,00	2 801,36	0,03 %
PORTFOLIO (L=1)	167	1 728,90	463,36	730,00	2 851,65	0,04 %
PORTFOLIO (L=2)	166	1 728,63	**462,51**	730,00	2 802,72	0,03 %
PORTFOLIO (L=3)	165	1 727,10	465,76	730,00	2 812,50	0,01 %

Appendix 42
VEC Derived, Quarterly Adjusted Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active only in negative months of media sales performance. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 725,31	462,60	730,00	2 796,82	0,05 %
PORTFOLIO (S=3)	93	1 738,60	462,61	736,40	2 809,74	0,54 %

Appendix 43
OLS Derived, Constant Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,94	462,96	679,45	2 800,97	0,03 %
SANOMA (L=1)	167	1 728,60	463,85	718,41	2 840,32	0,02 %
SANOMA (L=2)	166	1 728,82	**461,66**	712,08	2 805,57	0,05 %
SANOMA (L=3)	165	1 725,91	466,48	729,52	2 809,09	-0,06 %
TALENTUM	168	1 724,28	**462,25**	729,73	2 803,31	-0,01 %
TALENTUM (L=1)	167	1 728,02	**461,31**	728,23	2 804,67	-0,01 %
TALENTUM (L=2)	166	1 727,77	**462,84**	727,70	2 803,95	-0,02 %
TALENTUM (L=3)	165	1 726,83	464,59	729,52	2 804,53	0,00 %
ALMA MEDIA	93	1 730,20	**452,20**	800,93	2 842,96	0,05 %
ALMA MEDIA (L=1)	92	1 742,80	**446,76**	889,24	2 802,54	0,38 %
ALMA MEDIA (L=2)	91	1 733,82	**448,00**	924,04	2 779,27	-0,12 %
ALMA MEDIA (L=3)	90	1 735,98	**446,01**	881,06	2 796,97	0,12 %

Appendix 44
VEC Derived, Constant Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in negative months and speculative for positive months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,04	463,05	666,88	2 800,32	0,03 %
TALENTUM	168	1 724,11	**461,70**	729,48	2 802,66	-0,02 %
ALMA MEDIA	93	1 730,35	**453,27**	781,07	2 849,63	0,06 %

Appendix 45
OLS Derived, Constant Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,82	463,31	682,75	2 802,83	0,02 %
SANOMA (L=1)	167	1 728,57	463,82	718,85	2 839,03	0,02 %
SANOMA (L=2)	166	1 728,79	**462,16**	717,58	2 802,14	0,04 %
SANOMA (L=3)	165	1 726,68	466,14	722,20	2 810,47	-0,01 %
TALENTUM	168	1 723,84	465,87	733,10	2 815,40	-0,04 %
TALENTUM (L=1)	167	1 726,91	**461,54**	734,74	2 762,22	-0,08 %
TALENTUM (L=2)	166	1 728,56	**462,62**	711,22	2 787,20	0,03 %
TALENTUM (L=3)	165	1 728,88	464,91	704,20	2 811,51	0,11 %
ALMA MEDIA	93	1 729,90	**452,02**	813,50	2 842,26	0,03 %
ALMA MEDIA (L=1)	92	1 739,67	**444,66**	898,41	2 777,19	0,20 %
ALMA MEDIA (L=2)	91	1 742,85	**452,41**	909,70	2 761,27	0,40 %
ALMA MEDIA (L=3)	90	1 731,42	**456,11**	880,10	2 797,52	-0,15 %

Appendix 46
VEC Derived, Constant Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in negative months and speculative for positive months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,04	463,05	666,88	2 800,32	0,03 %
TALENTUM	168	1 724,11	**461,70**	729,48	2 802,66	-0,02 %
ALMA MEDIA	93	1 730,35	**453,27**	781,07	2 849,63	0,06 %

Appendix 47
OLS Derived, Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 733,72	469,31	786,23	2 830,32	0,25 %
PORTFOLIO (L=1)	92	1 743,44	**452,22**	894,54	2 875,24	0,41 %
PORTFOLIO (L=2)	91	1 729,02	**459,98**	724,43	2 754,65	-0,40 %
PORTFOLIO (L=3)	90	1 726,63	**460,66**	875,90	2 839,29	-0,42 %

Appendix 48
OLS Derived, Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 724,78	463,27	682,80	2 802,92	0,02 %
PORTFOLIO (L=1)	167	1 728,38	463,62	718,55	2 837,42	0,01 %
PORTFOLIO (L=2)	166	1 728,74	**462,16**	717,56	2 801,66	0,04 %
PORTFOLIO (L=3)	165	1 726,73	466,27	720,98	2 810,97	-0,01 %

Appendix 49
VEC Derived, Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios remain constant and are not adjusted at any point in time. Hedge is active in negative months and speculative for positive months of media sales performance. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 724,84	**462,51**	669,35	2 799,92	0,02 %
PORTFOLIO (S=3)	93	1 734,36	464,71	753,81	2 834,30	0,29 %

Appendix 50
OLS Derived, Monthly Adjusted Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,96	**462,53**	701,42	2 798,60	0,03 %
SANOMA (L=1)	167	1 729,40	465,03	722,66	2 868,65	0,07 %
SANOMA (L=2)	166	1 728,07	**461,29**	718,65	2 806,79	0,00 %
SANOMA (L=3)	165	1 725,94	466,34	730,00	2 813,06	-0,06 %
TALENTUM	168	1 724,18	**462,35**	729,73	2 801,13	-0,02 %
TALENTUM (L=1)	167	1 727,91	**461,12**	728,22	2 806,77	-0,02 %
TALENTUM (L=2)	166	1 727,60	**462,75**	727,68	2 803,79	-0,03 %
TALENTUM (L=3)	165	1 726,93	464,38	729,51	2 806,20	0,00 %
ALMA MEDIA	93	1 730,33	**451,10**	872,29	2 840,82	0,06 %
ALMA MEDIA (L=1)	92	1 739,87	**446,71**	906,31	2 802,62	0,21 %
ALMA MEDIA (L=2)	91	1 734,10	**446,82**	933,10	2 780,63	-0,11 %
ALMA MEDIA (L=3)	90	1 732,92	**446,60**	903,15	2 797,35	-0,06 %

Appendix 51
VEC Derived, Monthly Adjusted Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,07	**462,59**	693,57	2 797,45	0,04 %
TALENTUM	168	1 723,90	**461,94**	729,48	2 798,42	-0,03 %
ALMA MEDIA	93	1 730,50	**451,81**	864,64	2 847,12	0,07 %

Appendix 52
OLS Derived, Monthly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,91	**462,80**	703,64	2 800,62	0,03 %
SANOMA (L=1)	167	1 729,37	464,97	722,89	2 867,08	0,07 %
SANOMA (L=2)	166	1 728,18	**461,71**	721,55	2 803,25	0,01 %
SANOMA (L=3)	165	1 726,59	466,05	726,29	2 813,75	-0,02 %
TALENTUM	168	1 724,34	465,26	736,02	2 815,24	-0,01 %
TALENTUM (L=1)	167	1 727,25	**461,33**	736,41	2 763,17	-0,06 %
TALENTUM (L=2)	166	1 729,10	**462,54**	721,19	2 787,27	0,06 %
TALENTUM (L=3)	165	1 728,49	464,99	717,66	2 811,87	0,09 %
ALMA MEDIA	93	1 730,08	**450,98**	877,29	2 840,01	0,04 %
ALMA MEDIA (L=1)	92	1 737,90	**445,19**	909,93	2 780,24	0,10 %
ALMA MEDIA (L=2)	91	1 739,06	**449,30**	918,96	2 764,26	0,18 %
ALMA MEDIA (L=3)	90	1 731,99	**450,88**	902,82	2 797,82	-0,11 %

Appendix 53
VEC Derived, Monthly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 725,06	**462,73**	693,83	2 798,42	0,03 %
TALENTUM	168	1 723,98	465,31	736,64	2 815,08	-0,03 %
ALMA MEDIA	93	1 727,22	**452,59**	931,49	2 833,93	-0,12 %

Appendix 54
OLS Derived, Monthly Adjusted Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 736,52	467,67	834,06	2 802,41	0,42 %
PORTFOLIO (L=1)	92	1 743,46	**454,04**	905,94	2 904,12	0,42 %
PORTFOLIO (L=2)	91	1 730,23	**456,67**	883,24	2 758,77	-0,33 %
PORTFOLIO (L=3)	90	1 726,45	**455,37**	899,20	2 852,37	-0,43 %

Appendix 55
OLS Derived, Monthly Adjusted Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 724,87	**462,76**	703,63	2 800,37	0,02 %
PORTFOLIO (L=1)	167	1 729,14	464,69	722,20	2 866,89	0,05 %
PORTFOLIO (L=2)	166	1 728,10	**461,69**	721,26	2 802,75	0,00 %
PORTFOLIO (L=3)	165	1 726,65	466,13	725,62	2 814,82	-0,01 %

Appendix 56
VEC Derived, Monthly Adjusted Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted monthly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 724,77	**462,22**	694,68	2 794,86	0,02 %
PORTFOLIO (S=3)	93	1 736,21	462,97	829,91	2 812,49	0,40 %

Appendix 57
OLS Derived, Quarterly Adjusted Single Short Position Results

Single short position hedge ratios based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,57	**462,31**	681,59	2 799,90	0,01 %
SANOMA (L=1)	167	1 729,29	465,68	713,03	2 853,11	0,06 %
SANOMA (L=2)	166	1 728,49	**461,43**	703,77	2 806,12	0,03 %
SANOMA (L=3)	165	1 726,14	467,85	729,83	2 810,89	-0,04 %
TALENTUM	168	1 724,44	**462,54**	729,41	2 801,56	0,00 %
TALENTUM (L=1)	167	1 727,93	**461,38**	726,07	2 806,35	-0,02 %
TALENTUM (L=2)	166	1 727,70	**462,85**	724,89	2 803,82	-0,02 %
TALENTUM (L=3)	165	1 726,87	464,50	728,93	2 805,87	0,00 %
ALMA MEDIA	93	1 729,16	**451,04**	817,32	2 833,81	-0,01 %
ALMA MEDIA (L=1)	92	1 739,74	**446,21**	893,16	2 802,88	0,20 %
ALMA MEDIA (L=2)	91	1 734,91	**447,40**	952,89	2 785,07	-0,06 %
ALMA MEDIA (L=3)	90	1 733,64	**446,78**	886,13	2 798,62	-0,02 %

Appendix 58
VEC Derived, Quarterly Adjusted Single Short Position Results

Single short position hedge ratios based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,59	**462,32**	669,48	2 799,02	0,01 %
TALENTUM	168	1 724,42	**462,27**	728,85	2 799,26	0,00 %
ALMA MEDIA	93	1 729,13	**451,70**	800,26	2 838,92	-0,01 %

Appendix 59

OLS Derived, Quarterly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,52	**462,59**	684,85	2 801,57	0,00 %
SANOMA (L=1)	167	1 729,26	465,61	713,52	2 851,84	0,06 %
SANOMA (L=2)	166	1 728,51	**461,84**	709,99	2 803,15	0,03 %
SANOMA (L=3)	165	1 726,68	467,18	722,42	2 811,60	-0,01 %
TALENTUM	168	1 724,18	465,21	733,80	2 813,51	-0,02 %
TALENTUM (L=1)	167	1 727,17	**460,81**	735,05	2 769,46	-0,06 %
TALENTUM (L=2)	166	1 728,78	**462,57**	712,05	2 789,84	0,04 %
TALENTUM (L=3)	165	1 728,26	464,65	704,79	2 810,66	0,08 %
ALMA MEDIA	93	1 728,99	**450,94**	827,92	2 833,23	-0,02 %
ALMA MEDIA (L=1)	92	1 737,82	**444,79**	900,92	2 783,94	0,09 %
ALMA MEDIA (L=2)	91	1 734,88	**447,62**	955,66	2 773,09	-0,06 %
ALMA MEDIA (L=3)	90	1 731,82	**453,46**	885,26	2 799,02	-0,12 %

Appendix 60

VEC Derived, Quarterly Adjusted Single Short And Long Market Position Results

Hedge ratios of single short position and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
SANOMA	168	1 724,57	462,46	669,79	2 799,84	0,01 %
TALENTUM	168	1 724,07	465,46	735,21	2 813,37	-0,02 %
ALMA MEDIA	93	1 727,03	**452,49**	942,31	2 829,19	-0,13 %

Appendix 61
OLS Derived, Quarterly Adjusted Portfolio Of Three Short And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	93	1 733,54	468,51	748,37	2 802,04	0,24 %
PORTFOLIO (L=1)	92	1 743,53	**453,91**	890,29	2 885,96	0,42 %
PORTFOLIO (L=2)	91	1 731,75	**461,07**	732,87	2 766,28	-0,24 %
PORTFOLIO (L=3)	90	1 726,24	**459,87**	878,09	2 844,52	-0,44 %

Appendix 62
OLS Derived, Quarterly Adjusted Portfolio Of Two Short And Long Market Position Results

Hedge ratios of Sanoma and Talentum short positions and long OMX25 market index position based on ordinary least squares regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. Monthly lag values are denoted by L in parentheses. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO	168	1 724,51	**462,58**	684,91	2 801,36	0,00 %
PORTFOLIO (L=1)	167	1 729,03	465,44	711,93	2 851,65	0,05 %
PORTFOLIO (L=2)	166	1 728,45	**461,84**	709,32	2 802,72	0,02 %
PORTFOLIO (L=3)	165	1 726,73	467,29	721,04	2 812,50	-0,01 %

Appendix 63
VEC Derived, Quarterly Adjusted Portfolio Of Short Positions And Long Market Position Results

Hedge ratios of Sanoma, Talentum and Alma Media short positions and long OMX25 market index position based on vector error correction regression. Hedge ratios are adjusted quarterly to fit Otavamedia's media sales cash flow. Hedge is active in negative months and speculative for positive months of media sales performance. S in parentheses denotes short position amount, 3 is all three and 2 is Sanoma and Talentum. N is sample size, MEAN is the average monthly cash flow in thousands of Euros, ST.DEV is the standard deviation, MIN and MAX represent minimum and maximum values in thousands of Euros. ANNUAL RETURN is the average return outperformance of the hedge portfolio compared to Otavamedia's media sales cash flow. Portfolios with lower standard deviation than Otavamedia's media sales cash flow are in bold.

	N	MEAN	ST.DEV	MIN	MAX	ANNUAL RETURN
OM	168	1 724,47	462,88	730,00	2 804,00	
PORTFOLIO (S=2)	168	1 724,56	**462,09**	671,86	2 796,82	0,01 %
PORTFOLIO (S=3)	93	1 733,86	463,80	736,40	2 809,74	0,26 %