Do dividends signal future earnings in the Nordic stock markets?

Review of Quantitative Finance and Accounting 44 (2015), 493-511.

Eva Liljeblom
Hanken School of Economics
P.O.Box 497, 00101 Helsinki
Finland.
Email: eva.liljeblom@hanken.fi

Sabur Mollah
Stockholm University
School of Business
106 91, Stockholm,
Sweden.
Tel: +46 8 16 3034 (Work)
Fax: +46 8 674 7440 (Work)
Email: sabur.mollah@fek.su.se ***(corresponding author)***

Patrik Rotter
EF Education First Ltd
Haldenstrasse 4
6006 Luzern
Switzerland.
Email: patrik.rotter@ef.com

Abstract: We study the informational content of dividends on three Nordic civil law markets, where other simultaneous but blurring motives for dividends may be weaker. Using aggregate data on real earnings per share and payout ratios, long time series from 1969 to 2010, and methodologies which address problems of endogeneity, non-stationarity and autocorrelation (including a Vector Error Correction Model approach), we find evidence on dividend signaling in Nordic markets. However, we also find heterogeneity in the relationship between dividends and earnings on markets similar in many respects, suggesting that even small variations in the institutional surroundings may be important for the results.

Key Words: Dividend Signaling, Information Content, Nordic Markets, Vector Error Correction Model (VECM)

JEL Classification: G35, G15, C32, C58

1. Introduction

Recent studies of dividends in the U.S. have reported on both the "disapperance" of dividends (Fama and French 2001), as well as of the fact that aggregate real dividends paid by industrial firms in fact have increased over the past two decades, although there has been a substantial concentration in the number of dividend paying firms (DeAngelo, DeAngelo, and Skinner 2004). However, Eije and Megginson (2008) demonstrate that the fraction of European firms paying dividends declines, while the real dividend payment and share repurchase steadily increase. Also other (not mutually exclusive with each other nor with the signaling hypothesis) theories for dividend payment in addition to the classical dividend signaling hypothesis, have gained ground, such as the catering theory of dividends developed by Baker and Wurgler (2004) and Li and Lie (2006) and tested by Denis and Osobov (2008) and Ferris et al. (2009). The findings of Ferris et al. (2009) indicate that the legal regime and its accompanying set of investor protections play a large role in whether dividend catering takes place.[1] However, Fracassi (2008) stress that positive stock price response is due primarily to signaling and catering hypotheses, and partially to the free cash flow hypothesis of agency problem.

At the same time, new methodologies used to test the information content of dividends (such as Vector Autoregressive Methods, often applied on aggregate dividends) have started to give supporting evidence to the classical dividend signaling hypothesis, see e.g. the results of Arnott and Asness (2003), Gwilym, Seaton, Suddason, and Thomas (2006), Lee and Rui (2007), as well as Lee (2010a) and (2010b).

There is an ongoing debate in the literature concerning the use of aggregate versus individual firm-level data in studies of the information content of dividends. Disappointing results on aggregate data include Farsio et al. (2004), who did not found any relationships between dividends and earnings. Daniels et al. (1997) have argued that the use of aggregate data may be the reason for not being able to find a causal relationship between dividends and future earnings in previous empirical research. They specifically argue that the information content of dividends cannot be tested without obtaining biased results on aggregate data. However, they only found a Granger-causal relationship between dividends and future earnings in 50 percent of their randomly picked individual firm-level U.S. observations, which does not give any strong support for their argument of getting results very different from those when using aggregate data. Dittmar and Dittmar (2002) in turn argue that firm-level data is more likely to affect the analysis due to corporate

[1] Dividend catering refers to the managerial behaviour of opportunistically modifying corporate payout policies when investor sentiment favours the payment of dividends. Investor sentiment for dividends is in turn often measured from the dividend premium (see Denis and Osobov, 2008; and Ferris et al. 2009), i.e. the difference between the market-to-book ratios between dividend payers and non-payers.

manipulations and earnings smoothing. Also Lee and Rui (2007) argue that firm-level data may cause biased estimates, and that aggregate data would therefore be preferred. Their results from a study on US data suggest that dividends convey information about future earnings, since dividends are found to Granger-cause future earnings, results similar also to Lee 2010a and Lee 2010b. Interestingly, the studies that have found a Granger-causal relationship between dividend and earnings on aggregate data are the ones using a VAR framework.

Most of the studies on dividend signaling on aggregate data, and applying methods that better take the time-series properties of the data into account, have been performed in common law countries. We expect that dividend signaling, if it exists, may be more easier detected in civil law countries, since dividend catering is weak in these countries (Ferris et al. (2009), i.e. there may be one determinant less to drive dividend policies, in which case it may be easier to detect a potential signaling behavior. We contribute to the literature on dividend signaling by offering new evidence from three civil law countries, the Nordic countries of Denmark, Norway, and Sweden. Interestingly, although close to each other in terms of general corporate governance levels (see e.g. Aggarwal et al. 2009), the countries differ largely in terms of the average value given to dividends. Using aggregate data on real earnings per share and dividend payout ratios, together with a methodology which takes problems due to non-stationarity as well as autocorrelation into account, we find strong support for dividend signaling in Sweden, and weak support in Norway.

Besides the question of whether dividends convey information of future earnings, we also contribute to the debate concerning the right way to test for the information content of dividends. Our results indicate that, contrary to some arguments in the literature, neither the long length of the sample period, nor the use of aggregate data instead of individual data, reduces the chances of finding significant relationships supporting dividend signaling. The methodology seems more likely to be the determining factor. Our varying results for the three Nordic countries also suggest that even smaller variations in legal regimes, corporate governance, ownership structures and / or macroeconomic environments may be of importance for the results.

The paper is structured as follows. Section 2 presents a literature review and the hypotheses to be tested in this paper. In section 3, the data and method are described. In section 4, we report on the results. Finally, section 5 offers a summary and concluding remarks.

2. Literature Review

Lintner (1956) was the first to recognize the information content of dividends, and the managerial reluctance to reduce dividends. According to Lintner (1956), the underlying reason behind the managerial reluctance to reduce dividends is that investors might interpret the action as a weakness in expected future earnings. Consequently, the decision to increase dividends would depend on the firm's expected earnings stability, since managers want to make sure that the firms earnings will not decline after a raise in dividends. Dividends would, therefore, in a sense lag behind expected earnings, and be characterized as sticky. The idea that dividends could convey information about expected future earnings has later formally been presented in a number of signaling models, see e.g. Bhattcharaya (1979), Miller and Rock (1985) and John and Williams (1985), where it is the informational asymmetry between managers and outside investors that provides room for signaling with dividends.[2] Alternative hypotheses for why dividends might be related to firm value include various agency cost based explanations: dividends reduce free cash flow (Easterbrook 1984), and may reduce agency problems between inside and outside shareholders (La Porta et al. 2000). Also clientele effects may produce a price reaction around dividend changes.

Lintner's observation of managerial reluctance to reduce dividends has empirically been studied on many markets, with varying results. Such studies may also be seen as preliminary studies of whether dividends might be able to carry information, since Kalay (1980) has shown that in order for dividends to convey information about future earnings, managers have to be reluctant to reduce dividends.[3] Kalay's (1980) own empirical evidence on US data on managerial reluctance to reduce dividends remains inconclusive, while DeAngelo et al. (1992) report supporting evidence. Supporting findings have also been reported for the UK, where Edward and Mayer (1986) used a survey approach regarding dividend policies directed at finance directors. They concluded that dividends are likely to be reduced if a decline in earnings is persistent, but unlikely if transient. Likewise, Marsh (1992) has shown that managers are reluctant to reduce dividends in the UK, and more recently also Brav et al. (2005) report, on the basis of the results from a survey to financial managers in the U.S. that 94 percent of the managers in dividend paying firms strongly or very strongly agree that dividend cuts are being avoided.

[2] The idea that dividends could signal information about future earnings is not at odds with the dividend irrelevance proposition of Miller and Modigliani (1961), since there are no informational asymmetries in that model, and dividends can alternatively to being paid out, be left within the firm (however, keeping the investment policy of the firm fixed).

[3] However, DeAngelo and DeAngelo (1990) have argued that there are several reasons for the reluctance to reduce dividends, besides that suggested by Lintner (1956). A reluctance to cut dividends might thus be a necessary but not sufficient condition for dividends to carry an informational content.

Also event study tests typically confirm that the price reactions to dividend cuts / omissions are typically greater than to dividend increases, and that dividends do have some information content, since stock prices react to dividend changes (see e.g. Aharony and Swary 1980; Dielman and Oppenheimer 1984; Healy and Palepu 1988; Fehrs et al. 1988; Asquith and Mullins 1983; Woolridge 1983; Brickley 1983; Kane et al. 1984; Kalay and Lowenstein 1985; Ofer and Siegel 1987; Dhillon and Johnson 1994; and Christie 1994; Abeyratna et al. 1996; Viswanath et al. 2002; and Cheng et al. 2007). [4] Michaely et al. (1995) have showed that dividend initiations lead to an increase in the stock price while omissions are followed by a stock price decline. Lee (1995), who investigated the relation between dividend shocks and stock price movements, has showed that stock prices do not only react to permanent changes but also to temporary changes in dividends. Finally, Amihud and Li (2006) have reported on the declining information content of dividend announcements, and found the effect to be a function of institutional holdings. However, most of the empirical evidence on stock price reactions to dividend announcements has been concentrated around developed markets (Mollah 2007) like the U.S. and the UK. Firm size has been shown to be a distinguishing factor regarding the relationship between dividend and security prices (Eddy and Seifert 1988; and Bajaj and Vijh 1995). Eddy and Seifert (1988) find that stock price reactions of small firms in comparison with big firms are greater when they experience an unexpected dividend increase. Bajaj and Vijh (1995) find that on average during dividend announcements, abnormal stock returns get larger the smaller the size of the firm. Zeghal (1983) has found empirical evidence showing that small firms are more transparent with their financial statements compared to large firms, and therefore the information content of dividends may depend on firm size.

Since there are, besides signaling, other potential explanations for why stock prices may react to dividend changes, a more direct test of whether dividends carry information about future dividends is to study the time-series relationship between dividends and future earnings /earnings growth. While some researchers have found evidence of a significant positive relationship between dividends and earnings (see e.g. Healy and Palepu 1988; Kao and Wu 1994; and Brook et al. 1998), many others have found only a weak or no relationship at all (Venkatesh 1989; DeAngelo et al. 1996; Benartzi et al. 1997; Daniels et al. 1997; Baker et al. 2001; and Farsio et al. 2004).

The results from most more recent research on the information content of dividend does not offer results different from the earlier ones, since there still is no consensus in empirical results. Nissim and Ziv (2001), Lee and Rui (2007) and Hanlon et al. (2006) find that dividends convey information on future earnings, while Fukuda (2000) and Grullon et al.

[4] See also e.g. Nissim and Ziv (2001), who with the reference to a number of studies conclude that it is well documented that dividend changes are positively associated with stock returns in the days surrounding the announcement.

(2005) find weak or no evidence of a dividend signaling effect. However, recent research on managerial reluctance to reduce dividends supports Lintner's (1956) observation of managerial reluctance to reduce dividends (Baker et al. 2001 and Lie 2005).

In addition to the empirical evidence on US and UK data, some empirical studies have been conducted on Western European markets. Ferris et al. (2009) tested the catering hypothesis in common law and civil law countries, and reported that, even though catering occurs in both common law and Scandinavian civil law groups, it is much stronger in common law than Scandinavian group.[5] Their results support La Porta et al.'s (1998) shareholders right and Eije Megginson's (2008) evidence on catering hypothesis in European civil law countries. Inspired by John and Williams (1985) with their dividend signaling model, based on different tax rates for capital gains and dividends, Amihud and Murgia (1997) have tested the dividend signaling model on German data. Their results do not contradict the US findings even though dividends are taxed at a preferable rate compared to the U.S. McDonald et al. (1975) have studied 75 French firms during a 7 year period in the 1960's and found support for the Lintner model. Dasilas et al. (2008) found evidence supporting the information content of dividends in their study of Greek listed firms. A handful of studies on the relationship between dividends and earnings have also been conducted on data beyond the US, the UK and Western Europe. Lee (2010a and 2010b) has tested dividend signaling on the Singapore and Australian markets, and found evidence of a dividend signaling effect and support for the observation of managerial reluctance to reduce dividends by Lintner (1956).

Most empirical studies of the relationship between dividends and earnings have been conducted using weak testing methods, such as the ordinary least squares (OLS) methodology (Lee 2010b). The OLS methodology assumes that the variables employed follow a stochastic process, which means that variables are assumed to be stationary. However, problems occur when conducting an OLS methodology but the variables are non-stationary, that is, when the variables are at least an I(1) process. In other words, they are integrated of order one and I(0) after being differenced in order to make them stationary. When there is integration of order one, and the variables are not cointegrated, OLS regressions are likely to produce spurious results (Brinca 2006). This implies that the t-statistics will be statistically significant, and the coefficient of determination will be high, indicating a meaningful relationship that is actually not there.

[5] Ferris et al. (2009) also suggest that the weak catering is because of idiosyncratic behavior of the private benefits of control or a lack of interest in exploring transitory market misevaluations of their equity.

However, if the variables are differenced in order to make them stationary, the long-run relationship might be destroyed (Munnell, 1992).

Another problem is autocorrelation. When the model applied is misspecified, autocorrelation in the error term might arise. An example is when the model includes lagged dependent variables. Part of the Lintner model includes prior year's dividends, so if the Lintner model is being tested with a simple OLS regression, the model will include a lagged dependent variable which means that the simple OLS regression may produce biased estimates (Frankfurter and Wood 2003).

A third problem that may occur when applying an OLS technique is the endogeneity bias (Mayston, 2005), which may e.g. occur in a multivariate regression when the independent variable is correlated with the error term of the regression model (Binstock et al. 2010). This specific issue can be dealt with by applying a Vector Auto-Regressive (VAR) framework, because all variables are treated as endogenous (Sims 1980).

So far, most of the empirical research on the informational content in dividends has also been conducted on US or UK data, while continental Europe has been overshadowed (Correia da Silva et al. 2004). In summary, the existing research on the topic is inconclusive, i.e. offers limited evidence on the information content of dividends. With respect to major methodological developments over time, there is also a lack of studies using the most recent methodologies and covering long enough time periods. The major objective of this paper is, therefore, to investigate if there is any informational content of dividends in the Nordic aggregate market. To be more specific, the following research question was addressed in the paper: Do dividends convey information about future earnings?

3. Data and Method

3.1 Data

Our study is based on the aggregate monthly data for Denmark, Norway and Sweden for the period from 1969 to 2010. Morgan Stanley Capital International (MSCI) Indexes have been chosen due to their high representation of the market capitalization in the Nordic countries, and the availability of the longest historical data. We have collected monthly levels of the price index, price-earnings ratios (P/E-ratios), dividend yields and the consumer price index (CPI) from Statistics Sweden and Investment Strategist at Handelsbanken Capital Markets. We have derived earnings per share

(EPS) and dividend payout ratio (DPR) from these data and the derivation procedure[6] for EPS and DPR is the same as Lee (2010b) and is also inspired by Arnott and Asness (2003) and Gwilym et al. (2006). A time series plot of EPS and DPR is presented in figures 1 and 2, respectively, to visualize the pattern of the data for these countries below.

INSERT FIGURES 1 AND 2 HERE

Non-stationarity of the EPS and DPR data are clearly visible in figures 1 and 2. Moreover, the Scandinavian banking crisis in early 1990s causes a serious economic downturn in these countries. The recession is reflected in the aggregate EPS and DPR data presented in figures 1 and 2, and in addition, a structural break is identified in all these three Nordic countries in the early 1990's. Besides the banking crisis, the structural break may also be related to the internationalization of the Nordic countries in the early 1990's (due to the abolishment of capital restrictions, in anticipation of the European Union), leading to a large inflow of international investors (with potentially different dividend preferences). The descriptive statistics are presented in Table 1.

INSERT TABLE 1 ABOUT HERE

The EPS series (as in Lee 2010b), is negative by construction, coming from the indexing and taking the natural logarithm of the resulting ratio, but it shows a slight upward trend. It is also notable that the Nordic countries pay (DPR) a very high and rather stable dividend.

3.2 Method

3.2.1 Unit Root Tests: The key relationship that we want to test is that between the time-series variables of real earnings per share (EPS) and the dividend payout ratio (DPR), in logarithmic form. We test EPS and DPR for non-stationarity by applying the Augmented Dickey-Fuller (ADF) procedure[7], which tests for unit root when the time

[6] The data used to derive real earnings per share (EPS) and the dividend payout ratio (DPR) are monthly values of the MSCI price indexes for the three Nordic countries, price-earnings ratios (P/E-ratios), dividend yields and the country specific consumer price indexes (CPIs). The monthly value for the price index is divided by the corresponding P/E-ratio to obtain earnings per share, which is then divided by the CPI to obtain real earnings per share (EPS). Dividend payout ratio (DPR) is obtained by multiplying dividend yield with the P/E-ratio.

[7] Serial correlation in the residuals encounters a problem in the Dickey-Fuller (Dickey and Fuller 1979) test, which drives into biased estimations. However, an appropriate lag selection removes the problem in the DF test (Brinca, 2006). Due to this problem, we have adopted the Augmented Dickey-Fuller (Dickey and Fuller 1981) test.

series variables are an I(1) process, and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, which is a Lagrange Multiplier (LM) test where the time series variables are an I(0) process.[8]

3.2.2 Johansen Procedure: If EPS and DPR are integrated of order one, that is an I(1) process and I(0) after being differenced once in order to make them stationary, the variables might be cointegrated. Therefore we next apply the Johansen (1991) procedure, which can be specified to measure long run effects and transitory effects. Depending on the outcome of the cointegration tests using Johansen procedure, a Vector Auto Regressive (VAR) or a Vector Error Correction Model (VECM) will be used in order to perform the ultimate test in our study. Since it is important that one formulates the deterministic term (when a constant, trend or dummy component is included in the cointegration) correctly in the Johansen test, otherwise, it might produce biased parameter estimates (Hendry and Juselius, 2001). We therefore also apply the Saikkonen and Lutkepohl cointegration test, which can eliminate this problem.[9] Since autocorrelation may lead to misspecification, and thus to biased and inconsistent estimates (Keele and Kelly 2006), we apply Lutkepohl's (2004) Portmanteau test which tests for autocorrelation up to a specific and specified lag in the residuals of a time series model instead of testing each distinctive lag.

3.2.3 Vector Auto-Regressive (VAR) Model/Vector Error Correction Model (VECM): The traditional VAR model can be used to estimate variables that depend on several combinations of lagged values and error terms of several variables, including lags of the dependent variable itself. If there is a cointegration between the variables, the VAR model has to be transformed into a VECM, which is a restricted VAR created to deal with non-stationary variables[10]. The VECM in this paper is in line with Johansen (1991) framework as:

$$\mathbf{\Delta EPS}_t = \sum_{j=1}^{k-1} \mathbf{\Gamma}_{11}\, \mathbf{\Delta} DPR_{t-j} + \sum_{j=1}^{k-1} \mathbf{\Gamma}_{12}\, \mathbf{\Delta EPS}_{t-j} + \mathbf{\Pi}_{11} DPR_{t-k} + \mathbf{\Pi}_{12} \mathbf{EPS}_{t-k} + \varepsilon_{\mathbf{EPS}t} \quad \ldots \quad (1)$$

[8] It has been argued that specifying the null hypothesis as a unit root or non-stationary may be a weakness of tests such as the ADF test (Pfaff 2008). For that reason, the Kwiatkowski-Phillips-Schmidt-Shin test (Kwiatkowski, Phillips, Schmidt, Shin, 1992) is also adopted in the study.

[9] The Saikkonen and Lutkepohl cointegration test is based on a reduced rank regression and differs from the Johansen procedure since it starts with an estimation of the deterministic term (Saikkonen and Lutkepohl 2000a, b, c and Lutkepohl 2004). The Johansen Trace procedure is then applied after the deterministic term is subtracted from the model. Saikkonen and Lutkepohl have suggested a Generalized Least Squares (GLS) procedure to estimate the specific parameters of deterministic term.

[10] Engle and Granger (1987) noticed that when modeling with VARs where the variables are cointegrated, their estimates in first differences or levels will be biased and therefore suggests the VECM (Penm et al. 1997).

$$\Delta DPR_t = \sum_{j=1}^{k-1} \Gamma_{21} \Delta DPR_{t-j} + \sum_{j=1}^{k-1} \Gamma_{22} \Delta \mathbf{EPS}_{t-j} + \mathbf{\Pi_{21}} DPR_{t-k} + \mathbf{\Pi_{22}} \mathbf{EPS}_{t-k} + \varepsilon_{DPRt} \quad \ldots(2)$$

where Π represents the product of the α and β matrix with the dimensions $(K * r)$, and K is the set of variables and r is the number of cointegrating relationships such that $\Pi = \alpha\beta'$. Π is often referred to as the long run parameter and Γ the short run parameter, which captures the long in the former and short run dynamics in the latter of the variables. But, when there is one cointegrating relationship, $\Pi = \alpha\beta'$ can be written as:

$$\Pi = \alpha\beta' = \begin{pmatrix} \alpha_{11} \\ \alpha_{12} \end{pmatrix} (\beta_{11} \quad \beta_{12}) \quad \ldots(3)$$

Furthermore, Granger-Causality (Granger 1969) is a widely used phenomenon in this context. When lagged values of a variable $\boldsymbol{y_t}$ contribute to an improvement of the forecast of a variable $\boldsymbol{x_t}$ after being controlled for lagged values of $\boldsymbol{x_t}$, it is said to be casual (Wooldridge 2005 and Lutkepohl 2004), i.e., $\boldsymbol{y_t}$ granger causes $\boldsymbol{x_t}$ if $\boldsymbol{y_t}$ is a useful predictor of $\boldsymbol{x_t}$. The Granger causality test has the ability of predicting each one of our variables statistical impact on their future value (Brooks 2008), that is, telling us if one variable Granger -causes the other. Brooks (2008) also argues that the information of a positive or negative relation or the time horizon of when the impact will take place cannot be predicted by a Granger-causality test but Impulse responses,[11] on the other hand, have the ability of doing so.

4. Results and Analysis

4.1. Results from stationarity tests

First, we test the EPS and DPR series for non-stationarity in their levels and first differences by applying the ADF test. The results are presented in Table 2.

INSERT TABLE 2 ABOUT HERE

[11] Impulse responses traces the reactions of the dependent variable to a unit shock of all the other variables in a dynamic system, that is, by hitting the error term with a shock, one traces the effects on the dependent variable over time (Brooks 2008).

The results in Table 2 (Panel A) indicate that EPS and DPR are non-stationary and contain a unit root in their levels. The null hypothesis of a unit root fails to be rejected for both EPS and DPR with drift and trend, trend only, and neither drift nor trend. Panel B in turn indicates that EPS and DPR are stationary and not containing a unit root in their first differences. The null hypothesis is rejected both when tested for drift and trend, trend only and with neither drift and nor trend. EPS and DPR are also tested for stationarity at their levels and first difference using KPSS. The lag order is determined by the truncation parameter l_q where q is frequently set to 4 and 12 (see Schwert 1989), which are both used in the test. The results are presented in Table 3.

INSERT TABLE 3 ABOUT HERE

As before, the results in Table 3 (Panel A) indicate that EPS and DPR are non-stationary in their levels, since the null hypothesis of a stationary process is rejected both at the 5 and 10 percent significance levels when tested with a constant and trend. Moreover, the test results in Panel B also indicate that EPS and DPR are stationary in first difference terms. The null hypothesis of a stationary process cannot be rejected when tested with a constant and trend on a 5 and 10 percents significance level. Therefore, the KPSS test indicates an integration order of one (i.e. an I(1) process), just like the prior ADF test. The identical results from both the ADF test and KPSS test increase the reliability concerning the order of integration, and the credibility that EPS and DPR are non-stationary in level terms. Consequently, the results also indicate that there might be a cointegrating relationship between the two variables.

4.2 Results from cointegration tests

The variables are tested for cointegration by applying the Johansen[12] Maximum Eigenvalue and Trace tests including constant. If too many lags are used, the degrees of freedom may consume too much power from the test, while not using enough lags may limit the test from capturing the proper dynamics (Brinca 2006). Therefore, the chosen lag order is 4 for both tests. In order to capture the short run effects of the relationship between EPS and DPR, the Johansen Maximum Eigenvalue and Trace tests are specified with a transitory procedure and the test results are reported in Table 4.

INSERT TABLE 4 ABOUT HERE

[12] Before the tests were applied, we wanted to determine the optimal lag order for the cointegration tests. The AIC, HQ, SC and FPE information criteria suggest an optimal lag order of 5, 4, 3 and 5, respectively.

The result of the Trace test for cointegration in Table 4 indicates a cointegrating relation between EPS and DPR. The null hypothesis of a cointegrating relation being r=0 is rejected between the variables at 5 and 10 percent significance levels. But the null hypothesis of the cointegrating relation being r=1 between the two variables failed to be rejected at a 5 and 10 percent significance level, which indicates that EPS and DPR are cointegrated. The results of the Maximum Eigenvalue test in turn indicate a cointegrating relation between EPS and DPR. The null hypothesis of a cointegrating relation being r=0 can also be rejected at a 5 and 10 percent significance level, while the null hypothesis of a cointegrating relation being r=1 failed to be rejected at a 5 and 10 percent significance level, which also support that the EPS and DPR are cointegrated.

Nevertheless, including a deterministic term (in our case a constant) might produce biased estimates if it is formulated incorrectly. Therefore, in addition to the Johansen procedure, a cointegration test (Saikkonen and Lutkepohl) that accounts for the deterministic term is applied with the same lag order as in the Johansen procedure since it goes by the Johansen Trace test after the deterministic term is estimated and subtracted. The outcome of the test are reported in Table 5.

INSERT TABLE 5 ABOUT HERE

The results of the Saikkonen and Lutkepohl test also support a cointegrating relation between EPS and DPR, and the null hypothesis of a cointegrating relation between the variables being r=0 is rejected at a 5 and 10 percent significance level. The null hypothesis of the cointegrating relation being r=1, on the other hand, failed to be rejected at 5 and 10 percent significance level.

The cointegration results based on the three tests performed clearly indicate that EPS and DPR are cointegrated, which means that the model will be specified with a VECM approach in order to avoid biased estimates.

4.3 Results from the VECM approach

Since the models applied in the paper deal with lag values, autocorrelation might cause biased and inconsistent estimates. In order to avoid this inefficiency, the residuals in the VECM are tested for autocorrelation by applying the Portmanteau test. The test results are reported in Table 6.

INSET TABLE 6 ABOUT HERE

The Portmanteau test for autocorrelation reports no autocorrelation in the residuals of the VECM up to 9 lags for Sweden, 13 lags for Denmark and 15 lags for Norway. The null hypothesis of no autocorrelation in the residuals up to specified lag order failed to be rejected, indicating that the VECM estimates are not likely to be biased and inconsistent.

When two variables are integrated of order one, that is, where both variables are an I(1) process, and cointegrated, then at least one of the variables must Granger-cause the other variable. The idea of dividend signaling is that dividends convey information about future earnings. If this is true, DPR should Granger-cause EPS. The test results are presented in Table 7.

INSERT TABLE 7 ABOUT HERE

The results in Table 7 offer mixed support for dividend signaling in the Nordic countries. There is some support for both DPR Granger-causing EPS for some countries, as well as EPS Granger-causing DPR. For Sweden, both null hypotheses of no Granger-causality are rejected at a significance level of 1 percent. This means, there is support for the informational content of dividends in Sweden. The results for the Swedish market are thus similar to the results of Lee and Rui 2007, Lee 2010a and Lee 2010b for US, Singapore, and Australia, respectively. But the results for the Danish and Norwegian markets are different. The result in Table 7 indicate that dividends do not convey any information about future earnings in Denmark, and we also obtain only weak support for signaling in Norway (the hypothesis of dividends not Granger-causing earnings being rejected only at the 10% level).

Concerning the specific case of Denmark, our results resemble those in Farsio et al. (2004), who found no significant Granger-causal relationships between dividends and earnings. Based on their simple OLS regression and Granger causality test, Farsio et al. suggested that the results from earlier studies reporting positive or negative relationships between dividends and earnings were due to limited data samples, and that long sample periods would indicate no relationship between dividends and earnings in the long run. However, the sample period does not seem to have any major influence on the Granger-causality test for investigating the relationship between dividends and earnings since

both Lee (2010a&b), as well as our study, both using data for time periods longer than 30 years, have found some significant relationships (in our case, a strong relationship for Sweden) between dividends and earnings.

There are several differences between these prior studies of the relationship between dividends and earnings including our study. First of all, Farsio et al. (2004) have used a sample period of 14 years (1988-2002) to estimate their simple OLS regression and 12 years (1988-2000) in their Granger causality test and Daniels et al. (1997) have used 15 years (1975-1990), Lee and Rui (2007) 8 years (1992-2000), Lee (2010a) 17.5 years (Jan 1990- June 2007) and Lee (2010b) over 39 years of data (1969-2009) while our study is based on over 41 years of data. Secondly, Daniels et al. (1997) use firm-level data while all the other studies use aggregate data, including our study. Thirdly, all of the above mentioned empirical studies have been conducted on the US data excepting Lee (2010a and 2010b), who have investigated the Singapore and Australian markets. We provide further evidence concerning three Nordic markets. Finally, our methodologies differ, this study as well as those of Lee (2010a and 2010b), and Lee and Rui (2007), being implemented in VAR frameworks suited for handling endogeneity, which is not the case in Farsio et al. (2004) and Daniels et al. (1997).

Our study provides some additional information to the debate on how to study the relationship between dividends and earnings using aggregate data. The results indicate that, contrary to some arguments in the literature, neither the long length of the sample period, nor the use of aggregate data instead of individual data, reduces the chances of finding significant relationships supporting dividend signaling when using a Granger-causality test. The methodology seems more likely to be the determining factor. Our varying results for the three Nordic countries (in many ways similar to each other) also suggest that even smaller variations in legal regimes, corporate governance, ownership structures and macroeconomic environments are important for the results. Australia and the US are both Anglo-Saxon economies, and common law countries, while Nordic countries are civil law countries and differ both from the Anglo-Saxon and the Continental European model, even though Sweden is moving towards a more Anglo-Saxon inspired economy (Crouch and Streeck, 1997). The Anglo-Saxon law is derived from the common law; therefore, the civil law countries are different from Anglo-Saxon and common law countries. La Porta et al. (1998 and 2000) studies provide ample evidence on differences in shareholder protection and payout policies in different legal regimes. La Porta et al. (1998) stress that the common law countries offer better shareholder protection than civil law countries. In addition, in their follow-up research in 2000, they find that the common law countries pay higher dividends than the civil law countries. Lin (2013) finds that the common law countries pay higher dividends, and also that dividends are less sensitive to earnings there. The higher dividend sensitivity to earnings in civil law countries is in line with dividend signaling. If

shareholder rights are lower in civil law countries, perhaps there is a greater need for profitable firms to convey information through dividends. The results of the Granger-causality test in our paper support the idea that dividends convey information about future earnings in Sweden, less so in Norway, while no relationship was found for Denmark.

5. Summary and Conclusions

This study addresses the issue of the informational content of dividends in the aggregate markets for three Nordic countries, and makes several contributions to the literature.

We contribute to the literature concerning the signaling motive for dividends, and the information content of dividends, using a novel methodology applied to a data set where other, possibly blurring motives for dividend payments, may be weaker. The dividend signaling theory has recently been challenged in many studies. Most of the studies of the information content of dividends using more recent methods have been performed in common law countries such as the U.S., Singapore, and Australia. In such countries, multiple (not mutually exclusive) driving forces for dividends may be present, such as the catering motive, making it harder to study whether one specific motive (our target, the signaling motive) also is present. Since Ferris et al (2009) find weaker evidence of catering for civil law firms, we select such countries to our study. If dividend catering does produce behaviour that may cloud the information content of dividends, then civil law countries offer better opportunities for finding evidence in favour of dividend signaling.[13] We report results for three civil law countries, Denmark, Norway, and Sweden, using a long time series from 1969 to 2010. We apply the Granger-causality test. These tests indicate that dividend payout conveys information about future earnings in Sweden, while some support of Granger-causality is also obtained for Norway.

Second, our study provides some additional information to the debate on how to study the relationship between dividends and earnings. The results indicate that, contrary to some arguments in the literature, neither the long length of the sample period, nor the use of aggregate data instead of individual data, reduces the chances of finding significant relationships supporting dividend signaling. The methodology seems more likely to be the determining factor. Earlier empirical studies of the relationship between dividends and future earnings have typically been conducted with simple OLS techniques. Most time-series variables are non-stationary, so if the time-series variables of earnings and dividends are non-stationary, the OLS framework might yield spurious results. If the explanatory

[13] See also Lin (2013) who find that in civil law countries, dividends are more sensitive to earnings as compared to common law countries.

variables in the regression suffer from endogeneity, the OLS framework creates biased results. We are the first to use a VECM framework in the European Civil Law countries that prevents the problem of endogeneity and takes non-stationarity into account in order to avoid spurious, biased or inconsistent results when examining the relationship between dividends and earnings.

Finally, Baker (2009) stresses the view that despite the legal frameworks, tax regimes, corporate governance, ownership structures and macroeconomic environments, which differ between countries, the driving forces for dividend policy are similar. However, our varying results for the three Nordic countries (in many ways similar to each other) suggest that even small variations in legal regimes, corporate governance, ownership structures and macroeconomic environments may be important for the results.

Acknowledgements:

We thank Mats Nyman, Investment Strategist at Handelsbanken Capital Markets for data support. We thank Mark Shackleton and other participants at 48th BAFA meeting, 17-19 April, 2012, UK. We are also thankful to the discussants and participants at the 49th BAFA meeting, 9-11, April, 2013, Newcastle, UK, the 20th Global Finance Conference, 20-22 May, 2013, Monterey Bay, California, USA, and the World Finance Conference, 1-3 July, 2013, Limassol, Cyprus, for valuable comments. We are grateful to the Editor and an anonymous referee for valuable comments.

References

Abeyratna G, Lonie AA, Power DM, Sinclair CD (1996) The Influence of Company Financial Performance on the Interpretation of Dividend and Earnings Signals: A Study of Accounting and Market Based Data. British Accounting Review 28:229-247.

Aggarwal R, Erel I, Stultz R, Williamson R (2009) Differences in governance practices between U.S. and foreign firms: Measurement, causes, and consequences. Review of Financial Studies 22:3131-3169.

Aharony J, Swary I (1980) Quarterly dividend and earnings announcements and stockholders' returns: An empirical analysis. Journal of Finance 35:1–12.

Amihud Y, Murgia M (1997) Dividends, taxes and signaling: Evidence from Germany. Journal of Finance 52:397–408.

Amihud Y, Li K (2006) The Declining Information Content of Dividend Announcements and the Effects of Institutional Holdings. Journal of Financial and Quantitative Analysis 41:637-660.

Arnott R, Asness C (2003) Surprise! Higher Dividends = Higher Earnings Growth. Financial Analysts Journal 59: 70-87.

Asquith P, Mullins DW (1983) The Impact of Initiating Dividend Payments on Shareholders Wealth. The Journal of Business 56:77-96.

Bajaj M, Vijh AM (1995) Trading Behavior and the Unbiasedness of the Market Reaction to Dividend Announcements. Journal of Finance 50:255-279.

Baker HK, Veit ET, Powell GE (2001) Factors Influencing Dividend policy Decisions of NASDAQ Firms. The Financial Review 36:19-38.

Baker HK (2009) Dividends and Dividend Policy. John Wiley & Sons, Wiley Finance, ISBN10: 0470455802.

Baker M, Wurgler J (2004) A catering theory of dividends. Journal of Finance 59:1125–1165.

Bernartzi S, Michaely R, Thaler R (1997) Do Changes in Dividends Signal the Future or the Past? Journal of Finance 52:1007-1034.

Bhattacharya S (1979) Imperfect information, dividend policy and the bird in the hand fallacy. Bell Journal of Economics 10: 259–270.

Binstock RH, George LK, Cutler SJ (2010) Handbook of Aging and the Social Sciences. Academic Press, ISBN13: 9780123808806.

Brav A, Graham JR, Harvey CR, Michaely R (2005) Payout policy in the 21st century. Journal of Financial Economics 77:483–528.

Brickley JA (1983) Shareholder Wealth, Information Signalling and the Specially Designated Dividend: An Empirical Study. Journal of Financial Economics 12:187-209.

Brinca P (2006) The Impact of Public Investments in Sweden: A VAR Approach. Dissertation, Stockholm University.

Brook Y, Charlton W, Hendershott R (1998) Do Firms Use Dividends to Signal Large Future Cash Flow Increases? Financial Management 27:46-57.

Brooks C (2008) Introductory Econometrics for Finance. Cambridge University Press, ISBN10: 052169468X.

Cheng LTW, Fung HG, Leung TY (2007) Information Effects of Dividends: Evidence from the Hong-Kong Market. Review of Quantitative Finance and Accounting 28: 23-54.

Christie W (1994) Are dividend omissions truly the cruelest cut of all? Journal of Financial and Quantitative Analysis 29:459–80.

Correia da Silva L, Goergen M, Renneboog L (2004) Dividend Policy and Corporate Governance. Oxford: Oxford University Press, ISBN10: 0199259305.

Crouch C, Streeck W (1997) Political Economy of Modern Capitalism: Mapping Convergence and Diversity. Sage Publications (CA), ISBN10: 0761956522.

Daniels K, Shin TS, Lee CF (1997) The information content of dividend hypothesis: A permanent income approach. International Review of Economics & Finance 6:77-86.

Dasilas A, Lyroudi K, Ginoglou D (2008) Joint effects of interim dividends and earnings announcements in Greece. Studies in Economics and Finance 25:212-232.

DeAngelo H, DeAngelo L (1990) Dividend Policy and Financial Distress: An Empirical Investigation of Troubled NYSE Firms. Journal of Finance 45:1415-1431.

DeAngelo H, DeAngelo L, Skinner DJ (1992) Dividends and Losses. Journal of Finance 47:1837-1863.

DeAngelo H, DeAngelo L, Skinner D (1996) Reversal of Fortune, Dividend Signalling and the Disappearance of Sustained Earnings Growth. Journal of Financial Economics 40:341-371.

DeAngelo H, DeAngelo L, Skinner DJ (2004) Are dividends disappearing? Dividend concentration and the consolidation of earnings. Journal of Financial Economics 72:425–456.

Denis DJ, and Osobov I (2008) Why do firms pay dividends? International evidence on the determinants of dividend policy. Journal of Financial Economics 89: 62-82.

Dickey DA, Fuller WA (1979) Distribution of the Estimators for Time Series Regressions with a Unit Root. Journal of the American Statistical Association 74:427-431.

Dickey DA, Fuller WA (1981) Likelihood ratio statistics for autoregressive time series with a unit root. Econometrica 49:1057–1072.

Dielman TE, Oppenheimer HR (1984) An Examination of Investor Behavior During Periods of Large Dividend Changes. Journal of Financial and Quantitative Analysis 19:197-216.

Dhillon U, Johnson H (1994) The Effect of Dividend Changes on Stock and Bond Prices. Journal of Finance 49:281-289.

Dittmar AK, Dittmar RF (2002) Stock Repurchase Waves: an Explanation of the Trends in Aggregate Corporate Payout Policy. Working Paper, Indiana University.

Doornik JA (1998) Approximations to the asymptotic distributions of cointegration tests. Journal of Economic Surveys 12:573-593.

Easterbrook FH (1984) Two Agency-Cost Explanations of Dividends. American Economic Review 84:650-659.

Eddy A, Seifert B (1988) Firm Size and Dividend Announcements. Journal of Financial Research 11:295-302.

Edwards J, Mayer C (1986) An investigation into the dividend and the new equity issue practices of firms: Evidence from survey information. Working paper 80, Institute of Fiscal Studies.

Eije HV, and Megginson WL (2008) Dividends and Share Repurchase in the European Union. Journal of Financial Economics 89:347-374.

Engle R, Granger C (1987) Co-integration and Error Correction: Representation, Estimation and Testing. Econometrica 55:251-276.

Fama EF, French K (2001) Disappearing dividends: changing firm characteristics or lower propensity to pay? Journal of Financial Economics 60:3-43.

Farsio F, Geary A, Moser J (2004) The Relationship Between Dividends And Earnings. Journal For Economic Educators 4:1-5.

Fehrs DH, Benesh GA, Peterson R (1988) Evidence of a Relation Between Stock Price Reactions Around cash Dividend Changes and Yields. Journal of Financial Research 11:111-23.

Ferris SP, Jayaraman N, Sabherwal S (2009) Catering effects in corporate dividend policy: The international evidence. Journal of Banking & Finance 33:1730–1738.

Frankfurter GM, Wood BG (2003) Dividend Policy: Theory and Practice. Academic Press, ISBN10:012266051X.

Fracassi, C (2008) Stock Price Sensitivity to Dividend Changes. McCombs School of Business working paper. http://www2.mccombs.utexas.edu/faculty/cesare.fracassi/Price%20Sensitivity%20to%20Dividend%20Change%20-%20072808.pdf

Fukuda A (2000) Dividend changes and earnings performance in Japan. Pacific-Basin Finance Journal 8:53-66.

Granger CWJ (1969) Investigating Causal Relations by Econometric Models and Cross-spectral Methods. Econometrica 37:424–438.

Grullon G, Michaely R, Benartzi S, Thaler R (2005) Dividend Changes Do Not Signal Changes in Future Profitability. Journal of Business 78: 1659-1682.

Gwilym O, Seaton J, Suddason K, Thomas S (2006) International Evidence on the Payout Ratio, Earnings, Dividends, and Returns. Financial Analysts Journal 62:36-53.

Hanlon M, Myers J, Shevlin T (2006) The Information Content of Dividends: Do Dividends Provide Information about Future Earnings? Working Paper, www.ssrn.com.

Healy PM, Palepu KG (1988) Earnings Information Conveyed by Dividend Initiations and Omissions. Journal of Financial Economics 21:149-175.

Hendry DF, Juselius K (2001) Explaining cointegration analysis: Part II. The Energy Journal 22:75-120.

Johansen S (1991) Estimation and Hypothesis Testing of Cointegration Vectors in GaussianVector Autoregressive Models. Econometrica 59:1551-1580.

John K, Williams J (1985) Dividends, dilution, and taxes: a signaling equilibrium. The Journal of Finance 40:1053–1070.

Kalay A (1980) Signaling, Information Content, and the Reluctance to Cut Dividends. Journal of Financial and Quantitative Analysis 15:855-869.

Kalay A, Loewenstein U (1985) Predictable Events and Excess Returns: The Case of Dividend Announcements. Journal of Financial Economics 14:423.450.

Kane A, Lee Y, Marcus A (1984) Earnings and dividend announcements: Is there a corroboration effect? Journal of Finance 39:1091–99.

Kao C, Wu C (1994) Rational Expectations, Information Signalling and Dividend Adjustment to Permanent Earnings. Review of Economics and Statistics 76:490-502.

Keele LJ, Kelly NJ (2006) Dynamic Models for Dynamic Theories: The Ins and Outs of Lagged Dependent Variables. Political Analysis 14:186-205.

Kwiatkowski D, Phillips PCB, Schmidt P, Shin Y (1992) Testing the Null Hypothesis of Stationarity against the Alternative of a Unit Root. Journal of Econometrics 54:159–178.

La Porta R, Lopez-de-Silanes F, Shleifer A, Vishny RW (1998) Law and Finance. Journal of Political Economy 106:1113-1155.

La Porta R, Lopez-de-Silanes F, Shleifer A, Vishny RW (2000) Agency problems and dividend policies around the world. The Journal of Finance 55:1-33.

Lee B (1995) The Response of Stock Prices to Permanent and Temporary Shocks to Dividends. Journal of Financial and Quantitative Analysis 30:1-22.

Lee B, Rui OM (2007) Time-series behavior of share repurchases and dividends. Journal of. Financial and Quantitative Analysis 42:119-142.

Lee KF (2010a) An Empirical Study of Dividend Payout and Future Earnings in Singapore. Review of Pacific Basin Financial Markets and Policies 13:267-286.

Lee KF (2010b) The Information Content of Dividend Policy on Future Earnings in Australia: A VECM Approach. International Research Journal of Finance and Economics 49:68-86.

Li W, Lie E (2006) Dividend Changes and Catering Incentives. Journal of Financial Economics 80: 293-308.

Lie E (2005) Operating Performance Following Dividend Decreases and Omissions. Journal of Corporate Finance 12:27-53.

Lin CT (2013) Dividend Policies, Legal Regimes and Market Systems in the Asian Pacific Region. Modelling and Simulation Society of Australia and New Zealand Inc. Working Paper no. MODSIM03/B17/03. http://www.mssanz.org.au/MODSIM03/Volume_03/B17/03_Lin_Dividend.pdf

Lintner J (1956) Distribution of Incomes of Corporations Among Dividends, Retained Earnings, and Taxes. American Economic Review 46:97-113.

Lutkepohl H (2004) Univariate time series analysis, in H. Lutkepohl and M. Kruatzig (eds). Applied Time Series Econometrics, Cambridge University Press, Cambridge:8-85.

Marsh P (1992) Dividend announcements and stock price performance, Mimeo, London Business School.

Mayston D (2005) Structural Determinants of Cumulative Endogeneity Bias. University of York Discussion Papers in Economics 2005:11.

McDonald J, Jacquillat B, Nussenbaum M (1975) Dividend, investment and financing decisions: Empirical evidence on French firms. Journal of Financial and Quantitative Analysis 10:741–55.

Michaely R, Thaler RH, Womack KL (1995) Price Reactions to Dividend Initiations and Omissions: Overreaction or Drift? Journal of Finance 50:573-608.

Miller MH, Modigliani F (1961) Dividend Policy Growth and the Valuation of Shares. Journal of Business (October):411-433.

Miller MH, Rock K (1985) Dividend Policy under Asymmetric Information. Journal of Finance 40:1031-1051.

Mollah S (2007) Price Reaction to Dividend Initiations and Omissions in Emerging Markets: Evidence from Pre and Post Market Crisis in Bangladesh. The International Journal of Business and Finance Research 1:51-68.

Munnell AH (1992) Policy Watch: Infrastructure Investment and Economic Growth. The Journal of Economic Perspectives 6:189-198.

Nissim D, Ziv A (2001) Dividend Changes and Future Profitability. Journal of Finance 56:2111-2134.

Ofer A, Siegel D (1987) Corporate financial policy, information, and market expectations: An empirical investigation of dividends. Journal of Finance 42:889–911.

Osterwald-Lenum M (1992) A Note with Quantiles of the Asymptotic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics. Oxford Bulletin of Economics and Statistics 55:461–472.

Pfaff B (2008) Analysis of Integrated and Cointegrated Time Series with R. Springer, New York, NY, ISBN 978-0-387-75966-1.

Penm JH, Penm JHW, Terrell RD (1997) The selection of Zero-non-zero Patterned Cointegrating Vectors in Error-Correction Modelling. Econometric Reviews 16:281-304.

Saikkonen P, Lütkepohl H (2000a) Testing for the cointegrating rank of a VAR process with an intercept. Econometric Theory 16:373-406.

Saikkonen P, Lütkepohl H (2000b) Testing for the cointegrating rank of a VAR process with structural shifts. Journal of Business & Economic Statistics 18:451-464.

Saikkonen P, Lütkepohl H (2000c) Trend adjustment prior to testing for the cointegrating rank of a vector autoregressive process. Journal of Time Series Analysis 21:435-456.

Schwert GW (1989) Tests for Unit Roots: A Monte Carlo Investigation. Journal of Business and Economic Statistics 7:147-160.

Sims C (1980) Macroeconomics and Reality. Econometrica 48:1-49.

Venkatesh PC (1989) The impact of dividend initiation on the information content of earnings announcements and returns volatility. Journal of Business 62:175-197.

Viswanath PV, Kim YK, Pandit J (2002) Dilution, Dividend Commitments and Liquidity: Do Dividends Change Reflect Information Signaling? Review of Quantitative Finance and Accounting 18: 359-379.

Woolridge JR (1983) Dividend Changes and Security Prices. Journal of Financial Research 5:237-247.

Zeghal D (1983) Industry, Market Structure, and Informational Content of Financial Structure. Journal of Accounting and Public Policy 2:115-131.

Table 1. Descriptive statistics of EPS and DPR for three Nordic countries

This table presents descriptive statistics (means, minimum and maximum values, and standard deviations) for our series of logarithmic real earnings per share (EPS) and dividend payout ratios (DPR) for Denmark, Norway, and Sweden for the time period of 1969 to 2010.

Country	Variable	Mean	Min	Max	Std.dev.
Denmark	**EPS**	-6.37	-7.69	1.23	-2.88
	DPR	7.71	1.21	8.92	2.56
Norway	**EPS**	-3.31	-5.87	2.28	2.22
	DPR	4.67	0.73	6.59	1.74
Sweden	**EPS**	-5.65	-7.49	0.61	1.13
	DPR	7.55	0.59	8.52	0.55

Table 2 . Results from tests of stationarity

This table presents Augmented Dickey-Fuller (ADF) test statistics of unit root for the real earnings per share (EPS) and dividend payout ratio (DPR) variables for the three Nordic countries (Denmark, Norway and Sweden). Panel A reports results of tests in level terms, whereas Panel B results from tests in first difference terms. The optimal lag found by the information criterions for EPS and DPR was 5 and 8 for Sweden, 8 for Denmark, and 10 for Norway. The critical values in tests with a drift and trend are -3,98 for 1% level of significance and -3,42 for 5% level of significance, with trend only -3,44 for 1% level of significance and -2,87 for 5% level of significance, and with neither drift nor trend -2,58 for 1% level of significance and -1,95 for 5% level of significance. *** denotes significance at the 1% level, and ** at the 5% level.

Panel A: Augmented Dickey–Fuller (ADF) test in level terms

Country	Variable	Test statistic with drift and trend	Test statistic with trend only	Test statistic with neither drift nor trend
Denmark	**EPS**	-3.5904**	-1.2174	-0.9351
	DPR	-3.2746	-1.9682	-0.9756
Norway	**EPS**	-4.1413***	-2.5674	-0.7309
	DPR	-3.8005**	-3.6862***	-0.2071
Sweden	**EPS**	-3.2931	-0.9356	-1.1844
	DPR	-2.8864	-2.6039	-0.3843

Panel B. Augmented Dickey–Fuller (ADF) test in first difference terms

Country	Variable	Test statistic with drift and trend	Test statistic with trend only	Test statistic with neither drift nor trend
Denmark	**EPS**	-11.2152***	-11.2156***	-11.1889***
	DPR	-9.4130***	-10.8896***	-10.8616***
Norway	**EPS**	-10.0672***	-8.9964***	-9.0020***
	DPR	-10.6891***	-10.6979***	-10.7093***
Sweden	**EPS**	-12.9781***	-12.9869***	-12.9392***
	DPR	-10.2317***	-10.2389***	-10.2464***

Table 3 . Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test

The table reports results from tests of stationary applying the Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test for the real earnings per share (EPS) and dividend payout ratio (DPR) variables for the three Nordic countries (Denmark, Norway and Sweden). Panel A reports results of tests in level terms, whereas Panel B results from tests in first difference terms. The lag order is determined by the truncation parameter l_q where q is frequently set to 4 and 12 (Schwert. 1989). The optimal lag found by the information criterions for EPS and DPR was 5 and 17 for Sweden, 5 and 17 for Denmark, and 5 and 16 for Norway. The critical values in tests with a constant are 0.463 for 5% level of significance and 0.347 for 10% level of significance, and with trend only, 0.146 for 5% level of significance and 0.119 for 10% level of significance. *** denotes significance at the 1% level.

Panel A. Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test in level terms

Country	Variable	l_q	Test statistic with constant	Test statistic with Trend Only
Denmark	**EPS**	12	2.4523***	0.2860***
		4	6.8237***	0.6315***
	DPR	12	2.1044***	0.3429***
		4	5.6222***	0.7849***
Norway	**EPS**	12	1.4621***	0.1487***
		4	4.2481***	0.2606***
	DPR	12	0.5513***	0.2705***
		4	1.0091***	0.4789***
Sweden	**EPS**	12	2.6124***	0.2051***
		4	7.5857***	0.5191***
	DPR	12	1.1713***	0.3649***
		4	3.0221***	0.8945***

Panel B: Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test in first difference terms

Country	Variable	Lq	Lags	Test statistic with a constant	Test statistic with a trend
Denmark	**EPS**	12	17	0.0418	0.0225
		4	5	0.0173	0.0093
	DPR	12	17	0.0271	0.0278
		4	5	0.0109	0.0112
Norway	**EPS**	12	16	0.0233	0.0190
		4	5	0.0117	0.0095
	DPR	12	16	0.0255	0.0229
		4	5	0.0114	0.0102
Sweden	**EPS**	12	17	0.0565	0.0422
		4	5	0.0272	0.0203
	DPR	12	17	0.0292	0.0292
		4	5	0.0136	0.0136

Table 4. Results from the Johansen cointegration Trace and the Maximum Eigenvalue tests

The table reports results from Johansen cointegration Trace tests, and Maximum Eigenvalue tests, for the real earnings per share (EPS) and dividend payout ratio (DPR) variables for three Nordic countries (Denmark, Norway and Sweden). The critical values for the Trace test are 9.24 for 5% level of significance and 7.52 for 10% level of significance when there is at least 1 cointegrating relation, and 19.96 for 5% level of significance and 17.85 for 10% level of significance when there is no cointegrating relation. The critical values for the Maximum Eigenvalue test are 9.24 for 5% level of significance and 7.52 for 10% level of significance when there is at least 1 cointegrating relation, and 15.67 for 5% level of significance and 13.75 for 10% level of significance when there is no cointegrating relation. ** denotes significance at the 5% level, and * at the 10% level.

Country	**Cointegrating relations**	**Trace test statistic**	**Maximum Eigenvalue test statistic**
Denmark	**r <= 1**	1.83	1.83
	r = 0	27.38**	25.55**
Norway	**r <= 1**	1.71	1.71
	r = 0	20.59**	18.88**
Sweden	**r <= 1**	3.43	3.43
	r = 0	22.61**	19.18**

Table 5: Results from the Saikkonen and Lutkepohl cointegration tests

The table reports results from Saikkonen and Lutkepohl cointegration tests, for the real earnings per share (EPS) and dividend payout ratio (DPR) variables for three Nordic countries (Denmark, Norway and Sweden). The critical values for the test are 4.13 for 5% level of significance and 2.98 for 10% level of significance when there is at least 1 cointegrating relation, and 12.26 for 5% level of significance and 10.47 for 10% level of significance when there is no cointegrating relation. ** denotes significance at the 5% level, and * at the 10% level.

Country	**Cointegrating-relations**	**Test statistic**
Denmark	**r <= 1**	0.96
	r = 0	12.41**
Norway	**r <= 1**	0.04
	r = 0	17.36**
Sweden	**r <= 1**	1.38
	r = 0	20.40**

Table 6. Results from asymptotic Portmanteau tests for autocorrelation

The table reports results from asymptotic Portmanteau tests for autocorrelation, for the real earnings per share (EPS) and dividend payout ratio (DPR) variables for three Nordic countries (Denmark, Norway and Sweden).

Country	Portmanteau test	With intercept
Denmark	**Test statistic**	50.5527
	p-value	0.1715
	Degrees of freedom	42
	Lag order	13
Norway	**Test statistic**	23.9841
	p-value	0.1555
	Degrees of freedom	18
	Lag order	15
Sweden	**Test statistic**	21.5673
	p-value	0.486
	Degrees of freedom	22
	Lag order	9

Table 7. Results from Granger causality tests

The table reports results from Granger causality tests for the real earnings per share (EPS) and dividend payout ratio (DPR) variables for three Nordic countries (Denmark, Norway and Sweden). The bi-directional Granger causality tests are conducted between EPS and DPR for the Nordic countries. Bi-directional Granger causality tests the null hypotheses between EPS and DPR, e.g. EPS does not Granger cause DPR and vice versa. The test statistics and p-values are presented in columns 3 and 4 respectively.

Country	Granger-Causality test with intercept	Test statistic	p-value
Denmark	H0: DPR Does not Granger-cause EPS	0.0119	0.9982
	H0: EPS Does not Granger-cause DPR	1.2387	0.2944
Norway	H0: DPR Does not Granger-cause EPS	1.7095	0.0666
	H0: EPS Does not Granger-cause DPR	0.4246	0.9456
Sweden	H0: DPR Does not Granger-cause EPS	8.6438	0.0000
	H0: EPS Does not Granger-cause DPR	16.5517	0.0000

Figure 1. Time series plot of real earnings per share (EPS)

The figure shows the time-series behavior of logarithmic real earnings per share (EPS) in three Nordic countries (Denmark, Norway and Sweden) from 1969 to 2010.

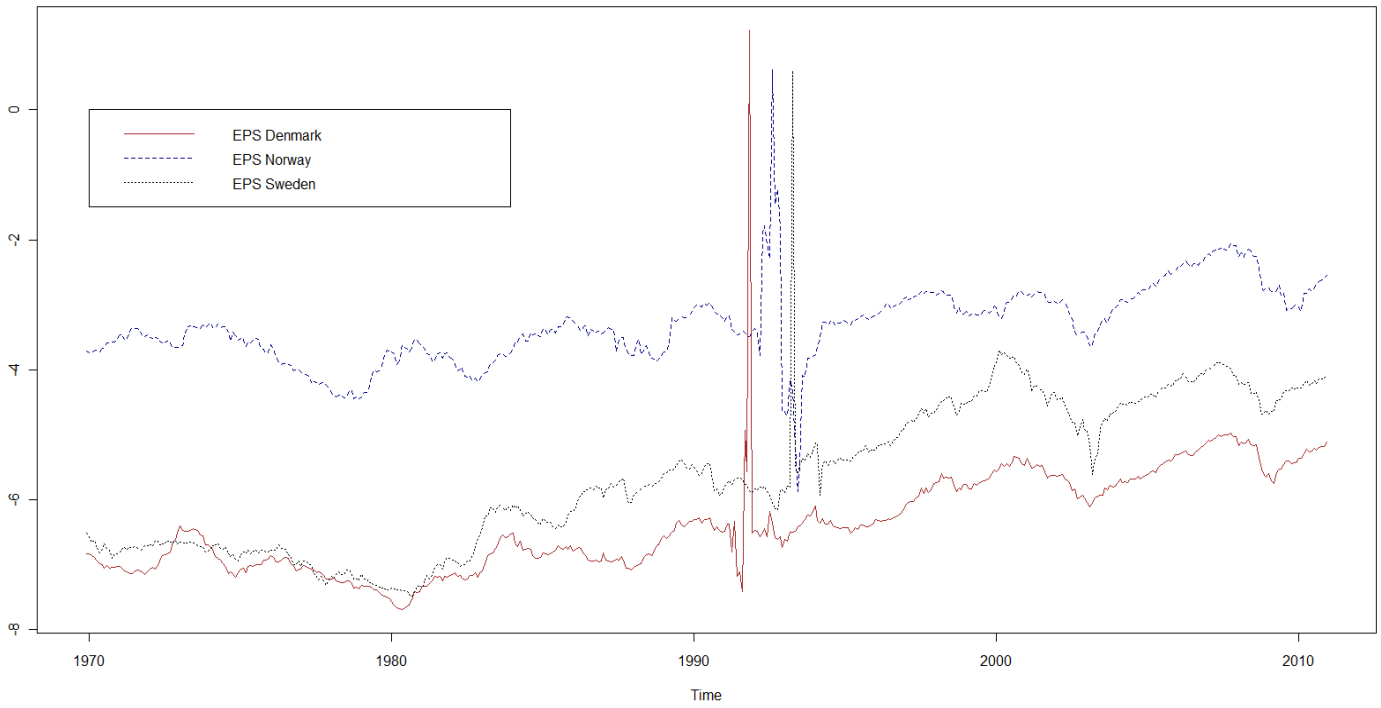

Figure 2. Time series plot of dividend payout ratio (DPR) series

The figure describes the time-series behavior of the logarithmic dividend payout ratio (DPR) series in three Nordic countries (Denmark, Norway and Sweden) from 1969 to 2010.