

«Big Fish»: Valuation of the world's largest salmon farming companies

Bård Misund*, Associate Professor, University of Stavanger Business School, Stavanger, Norway.

Email: bard.misund@uis.no Phone: +4741681729.

Rune Nygård, Lecturer, University College of South East Norway, Norway. Email:

rune.nygard@usn.no.

Abstract

The recent five years have seen a nearly tenfold increase the salmon stock price index at the Oslo Stock Exchange. This paper tries to shed some light on the reasons why this substantial stock price appreciation has occurred. The primary aim is to ascertain if the market valuation of salmon farming companies can be explained by rational factors, or there is an element of irrational exuberance behind current all-time high salmon stock prices. In particular, we examine the impact of both fundamental and operational value drivers. The results suggest that a structural shift has occurred, leading to a stronger association between fundamentals and market valuations after 2012, suggesting that at least some of the stock price increase is linked to fundamental factors.

Keywords: *salmon company valuation, price-to-book ratio, valuation multiples, salmon price, salmon aquaculture, salmon farming*

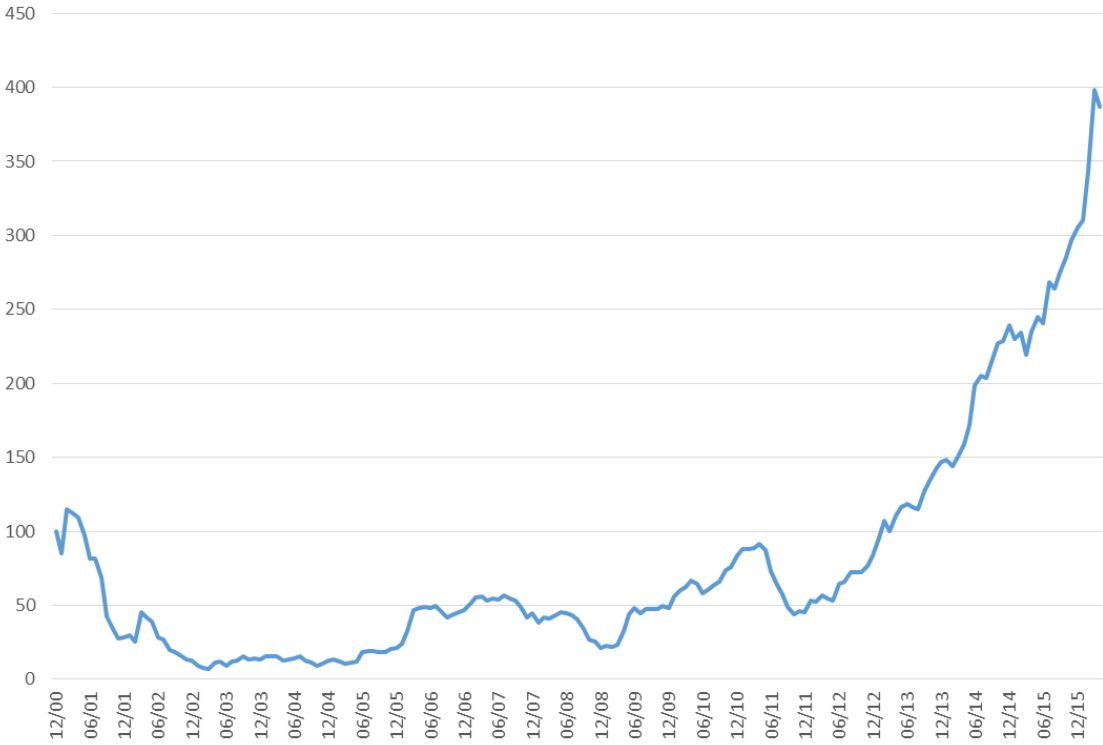
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Introduction

This paper studies the valuation of the largest salmon farming companies in the world, and how market prices of equity are influenced by key fundamental value drivers. Since May 2012, salmon stock prices have appreciated by an astonishing 43.5% per year (Figure 1). To the casual observer this increase can perhaps be attributed to a substantial increase in salmon spot prices (18.5%), and a general stock market bull market (12.2%).

Figure 1: Salmon stock index



Note. The index is calculated as an equally-weighted average monthly return for salmon farming stocks from December 2001 (Index = 100) to April 2016. The number of stocks included in the index has varied from 1 to 9 during 2001-2016.

However, the pass-through effect of salmon prices changes to stock price returns has been shown to be approximately 24% (Misund, 2017), suggesting that only around 4-5 percentage

points (out of 43.5% annual stock price returns) can be attributed to the impact of the 2012-2016 salmon price hike. Moreover, salmon stock betas are typically less than one, meaning that salmon stocks are less risky than the stock market on average (Misund, 2017). Hence, neither the salmon price increases that the salmon industry has seen over the last 5 years, nor the market risk premium, explain the substantial repricing of salmon stocks. Other, yet unidentified factors seem to have had a significant impact on valuations. These factors can be either rational or irrational. In the current study, we investigate whether rational factors, in the form of fundamental information, measured using financial ratios, explain the market valuation of salmon stocks. We conjecture that a strong association between fundamental information and market pricing suggests that valuations have a rational foundation. Moreover, by testing for structural breaks in the valuation - to - financial ratio relation after 2012, we can ascertain whether the recent re-pricing of salmon stocks has led to a change in the valuation process. A weaker association between fundamentals and market valuation after 2012 is indicative of irrational pricing of salmon farming stocks.

So, what factors affect the financial performance and fundamentals, and therefore the pricing of salmon farming companies? Previous studies suggest that a wide range of factors affect salmon company performance, both biological, technological, societal and economic factors.

First, economic factors such as developments in salmon prices, production costs, and productivity have a substantial impact on financial performance. Farmed salmon, and particular Atlantic salmon (*Salmo salar*), has witnessed remarkable success, at least in terms of growth in production and productivity (Tveterås & Heshmati, 2002; Asche, 2008; Smith et al., 2010; Vassdal & Holst, 2011; Asche, Guttormsen & Nielsen, 2013; Asche & Roll, 2013; Asche et al. 2015; Kumar & Engle, 2016) and demand (Asche et al., 2011; Xie & Myrland, 2011; Brækkan & Thyholdt, 2014; Brækkan, 2014). Despite the historical success, the Norwegian salmon farming industry is currently experiencing 'rough waters'. Productivity growth has fallen as the

industry has matured (Asche & Oglend, 2016). Moreover, salmon spot prices are more exposed to the prices of input factors than previously (Asche & Oglend, 2016). Salmon farming faces a multitude of biological, operational and market risks. Salmon prices are very volatile, also compared to other commodities (Oglend, 2013; Dahl & Oglend, 2014; Asche, Dahl & Steen, 2015; Bloznelis, 2016; Dahl, 2017). In fact, since 2006, salmon price volatility has doubled (Oglend, 2013; Bloznelis, 2016a). A strong link between variation in salmon prices and financial performance (Asche & Sikveland, 2015), will therefore exacerbate the impact of volatility increases on the market price risk exposure for salmon companies.

Second, societal issues such as regulations and policies have added to uncertainties. While salmon is mainly produced in a handful of countries, it is marketed world-wide. Trade disputes have been prevalent and have adversely affected fish farmers (Asche, 1997; Asche, Roheim & Smith, 2016). Recently, Osmundsen et al. (2017) points out that designing, implementing and overseeing adequate regulation and policy measures for salmon aquaculture has been very challenging. A main contributor being uncertainty and lack of knowledge for the impact of externalities of aquaculture production.

Third, King et al. (2016) point out that salmon aquaculture is “undertaken with considerable underlying levels of economic risks [...]” One of these being diseases. It is well-known that open salmon farming systems increase the risk of diseases and the impact of adverse environmental conditions such as alga blooms (Asche, 1997; Asche et al., 2010; Abolofia et al., 2017; Fischer, Guttormsen & Smith, 2017).

Despite the substantial risks that salmon farmers face, the industry has developed mechanisms to deal with many of these biological, technological and market risks. First, companies have become fewer and larger through extensive vertical and horizontal integration (Tveteras, 2002; Asche, 2008; Asche, Roll & Tveteras 2016). Second, they have increased their use of contracts (Kvaløy & Tveterås, 2008; Straume, 2014; 2017), and third, they have

developed more sophisticated supply chains and transaction mechanisms (Asche 2008; Asche et al., 2015; Kumar & Engle, 2016).

Lastly, as described above, a major determinant of financial performance, and variation in profitability, is the salmon price. In the recent decade, salmon farmers have been able to manage price risk using derivatives. In 2006, Fish Pool started trading derivatives contracts on the salmon spot price. An emerging literature have investigated the basic properties of salmon price derivatives (Solibakke, 2012; Asche, Oglend & Zhang, 2015; Ankamah-Yeboah, Nielsen & Nielsen, 2016; Asche, Misund & Oglend, 2016a, 2016b, Ewald et al., 2016; Ewald, Ouyang & Siu, 2016; Misund & Asche, 2016; Bloznelis, 2016b; Ewald & Ouyang, 2017). While the results on the price discovery role of salmon futures are mixed (Ankamah-Yeboah, Nielsen & Nielsen, 2016; Asche, Misund & Oglend, 2016a), recent studies suggest that salmon futures can be used for their primary purpose of hedging price risks (Misund & Asche, 2016). Hence, Fish Pool futures allow investors and buyers and sellers of salmon to hedge salmon price risk using Fish Pool futures.

In summary, although salmon farming is associated with substantial risks, several developments and mechanisms (such as increasing industry maturity and sophistication, introduction of financial instruments) have emerged in the last decade allowing farmers to mitigate risks. Moreover, since many of the risks are idiosyncratic an investor should be able to eliminate them from a well-diversified portfolio, and according to textbook finance theory, these types of risks should not influence market values. However, it is difficult for an investor to avoid the impact of irrational pricing behaviour on the returns of her stock portfolio.

The literature asserts that there are clear benefits of stock exchange listing, such as transparency of pricing, efficient transfer of capital, and access to external funding. However, irrational behaviour of investors can distort share prices away from their fundamentals (Shiller, 2015). The relationship between stock prices and fundamentals have been studied from various

perspectives over the years. The most common being using P/E and P/B ratios to forecast and explain share price movement (Campbell & Shiller, 2001; Chen, 2010; Penman, 2010). Among the conclusions from these studies is the notion that a stock's market value is a reflection of present fundamentals and expected future profitability and growth (Nissim & Penman, 2001). Reschreiter (2009) also argues that varying underlying ratios to stock price can be addressed to a combination of investors risk awareness and the growth rate of fundamentals. Most studies have been carried out on the U.S. stock market and few specifically on the salmon farming industry. Recent studies on broader markets, such as the OECD, suggest that there is a high correlation between fundamentals and stock returns (Albuquerque et al., 2017; Reschreiter, 2009, Zolotoy et al. 2017) and that the last bull markets have been rationally priced. Since 2012, salmon stocks have witnessed a sharp increase in market price. Many investors and analysts are questioning the sustainability of the repricing since salmon prices, like many other commodities, are highly cyclical (Andersen, Roll & Tveteras, 2008). The current high profitability in the industry should lead to increased investments and a subsequent increase in future production. The prices should follow the marginal costs, and not give rise to super profits in the long run. Rational pricing of salmon stocks should take this into account. The current paper seeks to examine whether salmon company stock prices are closely linked to their fundamentals, such as profitability, dividend yields, and systematic risk (discount rates). Furthermore, using structural break methodology, to investigate if stock prices have diverged from their fundamentals after 2012. This was also the year that the first global standards for salmon farming was agreed upon (ASC, 2012; Collins, 2012). As of 2017, the companies in this paper own most certified farms. Industry specific studies show that Government regulations can seldom be tracked in stock price movement (Binder, 1985). However, quality certifications implemented as a company decision indicate a positive effect on stock price (Nicolau & Sellers, 2001). Initial investments may result in negative market performance, but have long term

positive effects (Teng, et al., 2014). All companies in this paper are listed on the Oslo Stock Exchange and are regulated by The Norwegian Aquaculture Act. Consequently, they are already under a strict regulatory regime in a developed country and are all now ASC certified (ASC, 2017). Based on previous studies on stock price effects of certification, and assuming these companies would require less initial investments to be compliant, parts of the stock price rally from 2012 may also be addressed to this “certification effect”. Also, since institutional investors have implemented higher level of ethical and environmental restrictions on their portfolio management the last decade, more institutional investments are likely to be made in companies that comply with certain standards.

The remainder of the paper is organized as follows. The next section describes the methodology, followed by a description of the data. Then, the results are presented and discussed. The last section concludes.

Methodology

The dividend discount model (DDM), a cornerstone of modern finance, serves as the starting point of our analysis. The DDM model calculates the share price as the discounted stream of future dividends paid out to the firm’s owners,

$$P_t = \sum_{i=1}^{\infty} \frac{E[DIV_{t+i}]}{(1 + r_e)^i} \quad (1)$$

where P_t is the current share price, DIV_{t+i} are dividends arriving at time $t+i$, r_e is the discount rate (cost of equity capital), and $E[.]$ is the expectations operator. Assuming that dividends grow at a constant rate, g , Eq. (1) can be simplified to

$$P_t = \frac{DIV_{t+1}}{r_e - g} \quad (2)$$

Despite its crucial role in finance theory, the DDM model is seldom used in practice. In fact, evidence suggests that valuation multiples such as the price-to-earnings and price-to-book ratios dominate when practitioners carry out company valuation (DeAngelo, 1990; Kaplan & Ruback, 1995; Kim & Ritter, 1999; Demirakos, Strong & Walker, 2004). We therefore use valuation multiples as measures of market value of equity in the current study. To demonstrate the formal relationship between the valuation multiple price-to-book ratio and finance theory, we can re-express DDM (Eq. 1) as the valuation multiple price-to-book, P/B (see e.g. Bhojraj & Lee, 2002; Asche & Misund, 2016)¹

$$\frac{P_t}{B_t} = 1 + \sum_{t=1}^{\infty} \frac{E[(ROE_{t+i} - r_e)B_{t+i-1}]}{(1 + r_e)^i B_t} \quad (3)$$

where ROE_{t+i} is the return on book value of equity at time $t+i$, B_{t+i-1} is the book value of equity at time $t+i-1$, B_t is the current book value of equity. According to Eq. (3), a firm's P/B valuation ratio is a function of its expected ROE, cost of capital (risk), and growth rate in book value (B_{t+i-1}/B_t). Moreover, we can re-write ROE using DuPont analysis:

$$ROE_t = \frac{E_t}{B_t} = \frac{E_t}{R_t} \times \frac{R_t}{A_t} \times \frac{A_t}{B_t} \quad (4)$$

¹ We avoid using ratios such as P/E and EV/EBITDA in the empirical analysis since this leads to negative relationships between P/E and ROE (and EV/EBITDA and ROA). The reason is that the denominator in P/E is equal to the numerator in ROE ratio. Since E varies, more than P and B, the P/E will go down and ROE go up when earnings rise.

where E_t , R_t , and A_t are earnings (profits), revenues (sales) and assets at time t , respectively. Eq. (4) shows that the return on equity can be broken down into three new financial ratios, the profit margin (E/R), asset turnover (R/A), and the inverse of leverage (A/B).

Another way of obtaining the P/B ratio is to re-write Eq. (1) by using the relation that $DIV_t = E_t \times d$, where d is the dividend payout rate (i.e. proportion of profits paid out to investors as dividends), and $E_t = ROE_t \times B_{t-1}$. The P/B ratio derived from the DDM thus becomes

$$\frac{P_t}{B_t} = \frac{ROE_{t+1} \times d}{r_e - g} \quad (5)$$

In summary, Eqs. (3), (4), and (5) suggest that the price book ratio can be affected by several sources of fundamental information such as profitability (profit margin and ROE), dividend payout rates, leverage, asset turnover, risk, and growth rates in dividends (g_D) and book value (g_B). On general form, we can express the relationship as:

$$\frac{P_t}{B_t} = f\left(\frac{E_t}{R_t}, \frac{R_t}{A_t}, \frac{A_t}{B_t}, d, r_e, g_B, g_D\right) \quad (6)$$

We operationalize Eq. (6) for the purpose of empirical estimation:

$$\left(\frac{P}{B}\right)_{it} = \beta_0 + \beta_1 \frac{E_t}{R_t} + \beta_2 \frac{R_t}{A_t} + \beta_3 \frac{A_t}{B_t} + \beta_4 d + \beta_5 r_e + \beta_6 g_B + \beta_7 g_D + \varepsilon_{it} \quad (7)$$

where ε_{it} is the error term. To control for variables that cannot be observed we use panel data methods. We use a Hausman test to determine whether to use a fixed effects model or random effects model.

Visual inspection of Figure 1 suggests that a re-pricing of salmon stocks took place after 2012, perhaps as a result of irrational investor behaviour. If this is the case, we should see a change in the relationship between fundamentals and valuation since 2012. Using a dummy-variable approach (Gujarati, 1970a,b) we can ascertain empirically if this has been the case. The resulting empirical model becomes

$$\begin{aligned} \left(\frac{P}{B}\right)_{it} = & (\beta_0 + \beta_0^*) + (\beta_1 + \beta_1^*) \frac{E_t}{R_t} + (\beta_2 + \beta_2^*) \frac{R_t}{A_t} + (\beta_3 + \beta_3^*) \frac{A_t}{B_t} + (\beta_4 + \beta_4^*) d \quad (8) \\ & + (\beta_5 + \beta_5^*) r_e + (\beta_6 + \beta_6^*) g_B + (\beta_7 + \beta_7^*) g_D + \varepsilon_{it} \end{aligned}$$

where β_j is a set of reference parameters for the entire sample period, and $\beta_j^* = \beta_j \times D$ are the shift coefficients for the time period representing the structural break. The time dummy variable is set to 1 for observations after Q1-2012, and 0 otherwise. The presence of a structural shift is determined by running a joint significance test (Wald χ^2 test) on the shift coefficients, with a null hypothesis of no structural break.

Data

The data set is collected from quarterly financial reports from nine salmon farming companies listed on the Oslo Stock Exchange. Table 1 presents the firms in the data set.

Table 1. Overview of salmon companies listed on the Oslo Stock Exchange.

Company	Country	Market capitalization year-end 2016 (MUSD)	Assets year end 2016 (MUSD)
Marine Harvest	Norway	8,114	5,053
Salmar ASA	Norway	3,356	1,554
Lerøy Seafood ASA	Norway	3,317	2,904
Bakkafrost p/l	Faeroe Islands	1,928	767

Grieg Seafood ASA	Norway	1,044	783
Norway Royal Salmon ASA	Norway	1,042	430
Scottish Plc	U.K.	215	205

Our sample is limited to companies listed on the Oslo Stock Exchange. The reason we have limited our data sample to these companies is for reasons of consistency. The companies in our selection report according to same the IAS41 accounting standard. This is important since balance sheet and income statement values for salmon companies are substantially influenced by accounting regulation. IAS41 has been shown to influence the relation between accounting information and valuation (Misund, 2016, 2017). The other exchange listed salmon companies can be found in mainly Chile and Australia, and only consist of a handful of companies. Most salmon farming companies globally are either privately owned or part of conglomerates such as Mitsubishi.

We collect data on total revenues and net income from the income statement, and book values of equity and assets from the firms' balance sheets, and dividends from the statement of cash flows. Quarterly share prices, as well as equity betas, are collected from Reuters Datastream. The sample consists of 255 firm-quarter observations (based on nine companies during 2006 to 2016).

The variables we use in the empirical analysis are calculated as follows:

- Price-to-book ratio ($\frac{P_t}{B_t}$). Calculated as the ratio of the share price to the book value of equity per share, both at the end of the quarter.
- Profit margin ($\frac{E_t}{R_t}$). Calculated as the ratio of net income (earnings after interest and taxes) to the revenues (total sales revenues), both in the same quarter.
- Inverse leverage ($\frac{A_t}{B_t}$). Calculated as the ratio of total assets to the book value of equity, both at the end of the quarter.

- Dividend payout rate (d). Calculated as the ratio of dividends paid out during the quarter to the net income in the quarter.
- Cost of equity capital (r_e). As a proxy for r_e we use the equity beta on the market risk premium, estimated using the market model. The beta is reported by Reuters Datastream and is estimated using monthly excess returns (return on stock less the risk free rate) over 5 years.
- Growth in book values (g_B). Calculated as the percentage change in book equity from quarter $t-1$ to quarter t .
- Growth in dividends (g_D). This variable is omitted. Only a few of the firms pay out dividends on a quarterly basis, and the remainder have annual dividend payments. Calculating growth in dividend payments is therefore not possible. An alternative is to use a dividend dummy variable, but since we already have a dividend variable (d) among the other variables, we believe that the latter variable will capture some of the same effects as a dividend dummy variable.

Table 2 presents the descriptive statistics of the variables in the sample. The average price-to-book ratio is 1.832, meaning that the market prices, on average, the market value of equity to nearly double that of the book value. The high standard deviations suggest that the price-to-book ratio varies substantially. Furthermore, the average profit margin has been 11.6%, which is substantial. This means that the owners of salmon farming companies have been left with 11.6% of total revenues, after paying for operating expenses, investments, interest of debt, and taxes. This number suggests that salmon farming has been very profitable over the last decade.

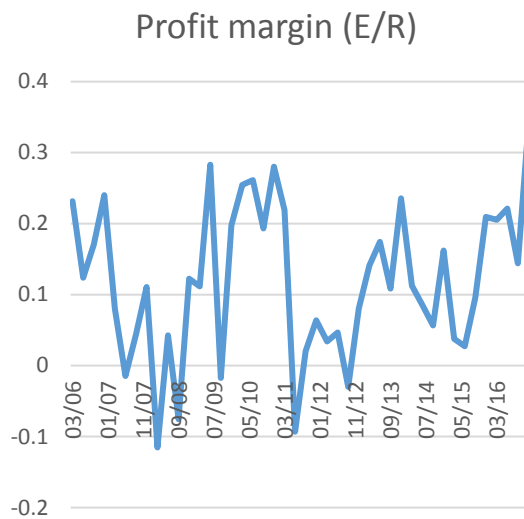
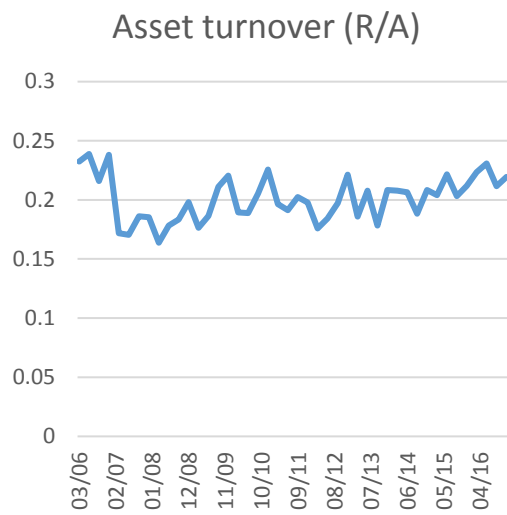
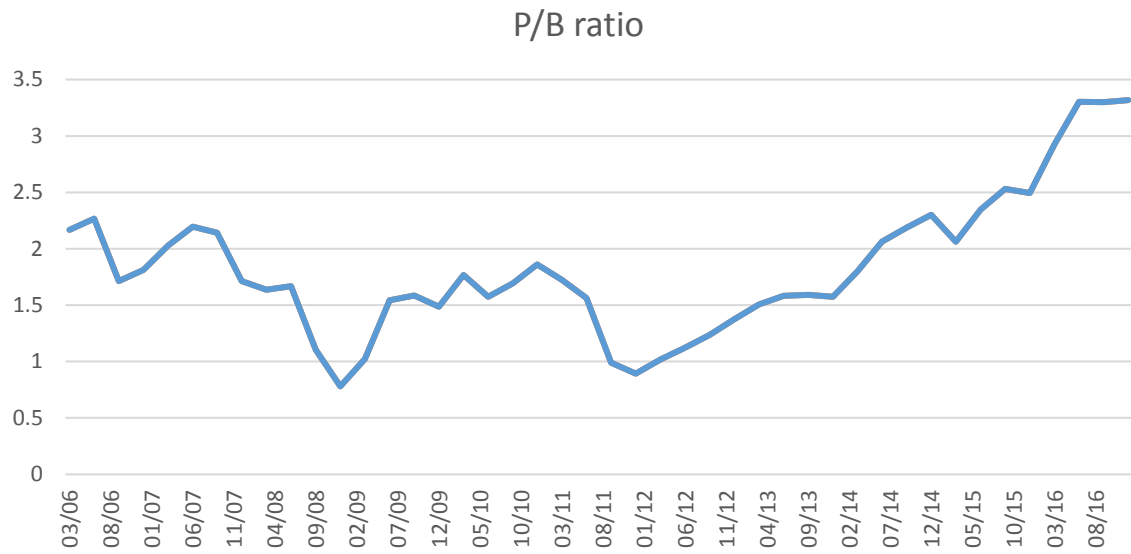
Table 2. Descriptive statistics

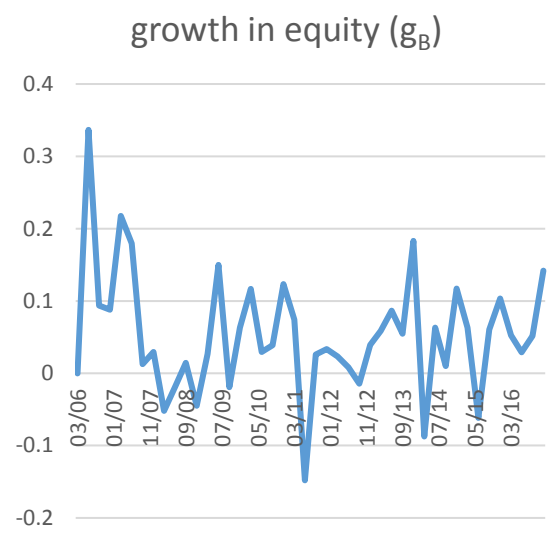
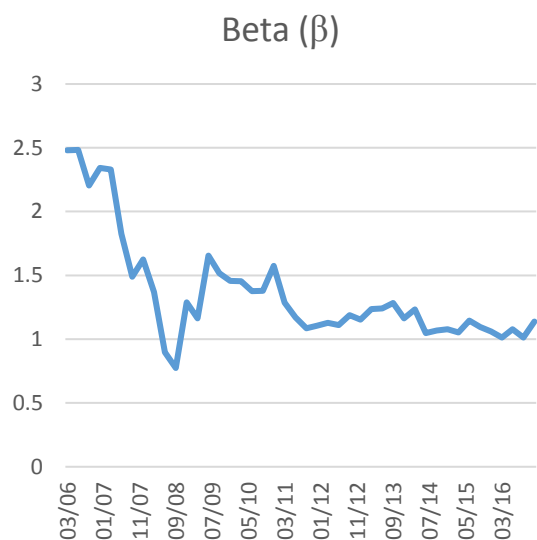
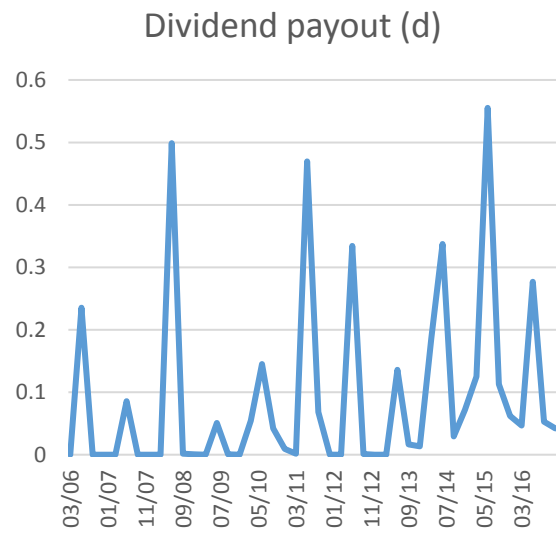
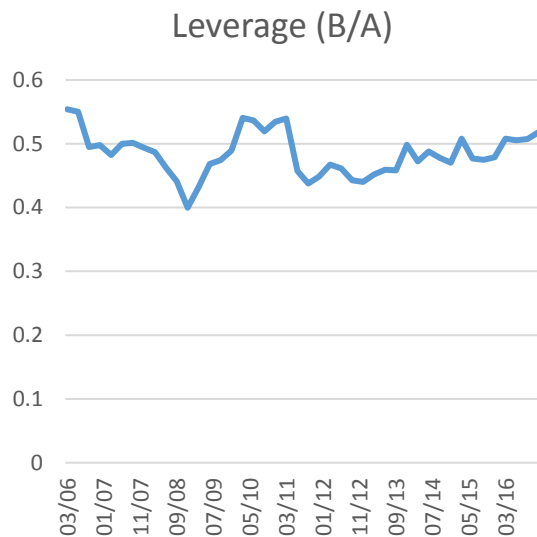
	Mean	SD	25 percentile	Median	75 percentile
$\frac{P_t}{B_t}$	1.832	0.971	1.098	1.581	2.378
$\frac{E_t}{R_t}$	0.116	0.171	0.022	0.105	0.198
$\frac{R_t}{A_t}$	0.200	0.065	0.160	0.192	0.231
$\frac{A_t}{B_t}$	2.083	0.330	1.853	2.036	2.275
d	0.098	0.255	0	0	0.001
r_e	1.262	0.641	0.890	1.070	1.325
g_B	0.046	0.128	-0.013	0.038	0.093

The asset turnover is 0.20, implying that a fifth of the assets are turned over each quarter. The inverse leverage ratio is approximately 2, which tells us that the firms in the sample are funded by nearly equal amounts of equity and debt. A dividend payout rate of 9.8% suggests that approximately 10% of the net income is paid out as dividends. However, the standard deviation is large, more than 2.5 times the mean, suggesting that dividend payments vary substantially across the sample. The high standard deviation may also be caused by many companies only paying annual dividend payments, resulting in many 0 values for the d variable.

To get an impression of the variation in the variables over time, we have calculated quarterly averages of the variables (Figure 2).

Figure 2. Evolution of average ratios over time.





We see that the P/B ratio seems to have followed an upward trend since around the beginning of 2012. While the asset turnover and leverage ratios seem to have been relatively stable over time, the profit margin has changed substantially, in the range -10% to +30%. The clear upward trend visible for the P/B ratio is not easily discerned for the profit margin.

The beta has fallen from around 2.5 on average in the start of the sample to around 1 in the latter years. There might be several reasons for this observation. First, there are relatively few company observations in the start of the sample period, making the estimate of the means less reliable. An alternative explanation is that the cost of equity capital has fallen, implying that the

repricing of salmon stocks can be explained (at least in part) by a decrease in the denominator in Eq. (1).

Table 3 presents the correlations between the variables. The correlations are relatively low, and highest being approximately 30%.

Table 3. Correlations

	$\frac{E_t}{R_t}$	$\frac{R_t}{A_t}$	$\frac{A_t}{B_t}$	d	r_e	g_B
$\frac{E_t}{R_t}$	1	-0.029	-0.196	-0.125	-0.013	0.451
$\frac{R_t}{A_t}$		1	-0.058	0.033	-0.331	0.046
$\frac{A_t}{B_t}$			1	-0.067	0.024	-0.156
d				1	-0.088	-0.298
r_e					1	-0.009
g_B						1

Tests for heteroscedasticity and serial correlation confirm the presence of both. We correct the standard errors using Stata's robust function.

Results & discussion

This section presents and discusses the results from the empirical tests. First, we determine whether to use a fixed effects or a random effects model using a Hausman tests. The null hypothesis of a fixed effects model is rejected and we therefore proceed with a random effects model. Second, for comparison, we present the results from the regression without structural shift (Table 3), before presenting the full model with tests for a structural break (Table 4).

Table 3 presents the results from the regressions assuming no structural break. The profit margin is significant at the 5% level, suggesting that profits are a determinant of the variation in price-to-book ratios, consistent with expectations. The most profitable firms are also the ones with the highest price-to-book multiples. The coefficients on asset turnover and inverse leverage are also significant. The signs on profit margins and asset turnover are positive, while the coefficient on leverage is negative. The latter result implies that a lower ratio (i.e. higher higher equity to assets, and therefore lower debt to assets) increases the P/B ratio. The interpretation is that firms with low debt levels are priced higher than firms with high financial leverage. Taken together, this suggests that the return on equity (ROE), or its components (profit margin, asset turnover and leverage), can explain the variation in the price-to-book ratio. None of the other variables are significant.

Table 3. No structure shift

	Coefficient	z-statistics	P-values
Constant	2.396	2.40	0.017
$\frac{E_t}{R_t}$	1.008	2.21	0.027
$\frac{R_t}{A_t}$	3.337	1.77	0.077
$\frac{A_t}{B_t}$	-0.559	-1.88	0.061
d	0.432	1.45	0.147
r_e	-0.164	-1.50	0.134
g_B	-0.351	-0.39	0.699

N	255
R2 (within)	0.156
R2 (between)	0.214
R2 (overall)	0.154

Note. The z-statistics and p-values are based on HACSE corrected standard errors, using Stata's robust function.

Next, we turn to the structural break model. In this model, only two coefficients are statistically significant. Consistent with the regression without structural break, we find a positive and significant association between the profit margin and the price-to-book ratio. However, we see that there has been a change from 2006-2011 and after 2012. The coefficient is only significant post-2012. Furthermore, the coefficient is 6-7 higher for the latter period compared to pre-2012, suggesting a closer association between fundamental information such as profitability and market valuation. The disappearing significance for the asset turnover and leverage ratios is disappointing, and could be a results of too few observations. The sample consists of only 9 firms, which limits the variation across firms.

Table 4. Structural shift regression

	Coefficient (when $D_B = 0$)	Coefficient (when $D_B = 1$)
$\frac{E_t}{R_t}$	0.592 (1.19)	3.525*** (4.49)
$\frac{R_t}{A_t}$	-0.595 (-0.27)	2.160 (1.20)
$\frac{A_t}{B_t}$	-0.203 (-0.49)	-0.224 (-0.57)
d	-0.051 (-0.15)	0.582 (1.21)
r_e	-0.245 (-0.99)	-0.601** (-1.96)

g_B	0.644 (1.00)	-1.265 (-1.33)
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N	255
R2 (within)	0.165
R2 (between)	0.753
R2 (overall)	0.345

Note. The z-statistics and p-values are based on HACSE corrected standard errors, using Stata's robust function. The dummy variable D_B takes the value 1 for quarters later than Q4-2011, and 0 otherwise.

The coefficient on the cost of equity (proxied by the equity beta) is negative in both periods, but statistically significant only after 2012. This result implies that lower systematic risk results in higher valuations, consistent with the standard equity valuation models such as Eq. (1).

Next, we investigate if there has been a structural break in 2012. The year 2012 is based solely on visual inspection of Figure 1, suggest that there has been a re-pricing since 2012. The Wald χ^2 90.94, and the null hypothesis of no structural break is rejected at the 1% significance level. We therefore conclude that since 2012 a structural break has occurred in the relation between value drivers and market valuation of salmon farming companies.

Conclusion

This paper investigates the market valuation of the world's largest salmon farming companies. Since 2012, salmon stocks valuations have surged and many commentators have suggested that the current pricing levels are unsustainable and a result of irrational pricing. Using a sample of salmon stocks listed at the Oslo Stock Exchange during 2006-2016, we investigate whether the valuations, measured by the price-to-book ratio, is associated with fundamental information

such as profitability, leverage, cost of capital, and dividends. Moreover, we investigate if the year 2012 represents a structural break in the association between market valuations and fundamentals.

Our results suggest that the pricing of salmon firms is dependent (at least in part) on fundamental information such as profitability (and its subcomponents) and the equity cost of capital. Furthermore, our results suggest a *stronger* association between fundamentals and pricing after 2012. Our results do not support the notion that the current levels of market values of salmon stocks are irrational, but rather a function of the extraordinary profitability the industry has witnessed in the recent 5 years.

A major limitation of this study is the low number of observations. It is well-known that inferences based on small samples should be done with care. We would have liked to have more observations, but this is difficult to achieve since most salmon farming firms are either privately owned or parts of conglomerates. However, according to Marine Harvest's Industry Handbook (www.marineharvest.com), our sample represents the majority of the production of salmon worldwide.

As outlined earlier in the paper, from 2012 the industry have agreed upon a common certification so that companies that comply will have to commit to certain quality and environmental standards. All companies in this study are certified according to ASC and further research could be to address specific stock price effects after certification.

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