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Currency substitution and risk management

A quantitave investigation into the currency substitution of Icelandic fisheries

by

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Summary

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Purpose
The purpose of this thesis has been to examine if currency substitution by Icelandic fisheries firms reduced it's earnings volatility and determine if the Icelandic króna negatively affects the industries earnings. Capital structure, currency exchange risk, functional currency and exchange rate-pass through are among concepts used in this thesis.

Methodology
We have been working with a quantitative method and collected data from the largest fishing companies in Iceland representing 85.17% of the market. We have used panel data and compiled our results in STATA. We have fourteen variables and three models which aim to give answers to our three hypotheses.

Theoretical perspectives
We have made a literature review including different aspects that we analyse our results with. Those aspects are fisheries management, risk management, foreign exchange risk, price hedging, commodity price hedging and functional currency. Together with the literature review we have worked with established financial theories. Those are Modigliani-Miller theorem, Pecking Order Theory, Trade Off Theory, Enterprise Risk Management (ERM), Exchange Rate Pass-Through (ERPT) and Purchasing Power Parity (PPP).

Empirical foundation
The empirical foundation consists of data collected from the 20 largest fishing companies on Iceland. These companies together represent 85.17% of the market. Three different hypotheses have been stated with associated equations. We were able to accept one out of these three hypotheses on the 5% significance level.

Conclusions
The general conclusion is that the choice of functional currency does not affect EBITDA in a statistically significant way. The use of Icelandic króna (ISK) does not lower EBITDA in a statistically significant way. The change of functional currency has not proven to reduce volatility in EBITDA.

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Andreas Windahl and Jóel Ísak Jóelsson
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Introduction

In the first chapter we will give a brief introduction to our topic with some basic background facts. We will further present our research questions together with the purpose of this thesis. We will also present the aim and scope of the thesis.

1.1 Introduction

In this paper we will examine the currency substitution of the Icelandic fisheries industry and whether the substitution is an appropriate mean in managing the many risks present in marine wild capture industries. We will start with a background proceed then to cover the fisheries management system in Iceland. We also cover previous literature in risk management, currency price, price hedging, functional currencies, enterprise risk management, purchasing power parity and exchange rate pass-through as well as reviewing other known theories. We use the literature review and our data to create models that we regress using ordinary least squares method with standard errors clustered by firm. Our results are that we find some statistical evidence for earnings to be negatively affected by the Icelandic króna, however not with good statistical confidence. We are unable to find evidence that firms who changed their functional currency from the Icelandic króna garner less volatility in their earnings, indicating that currency substitution, as a method in risk management is not appropriate. We believe this paper and it's result contribute not only to fisheries firms in Iceland still using the Icelandic króna but it also contributes to exporting industries in other countries using a small currency with high fluctuations.

1.2 Background

Iceland is a small but resource-rich country, most notably its vast fishing grounds and abundant renewable energy sources, and recently, its wilderness (Hilmarsson, 2017; Sæthorsdottir Saarinen, 2016). Further, according to the World Bank, Iceland has an economy that is very income-based but still one of the smallest economies within OECD. The characteristics of the Icelandic economy connote that the country is heavily dependent on trade with foreign countries. Trade with the European Union is crucial (Hilmarsson, 2017; Sæthórsdóttir and Saarinen, 2016).

The fishing industry was one of the most contributing factors to the strong economic growth in Iceland in the 20th Century. During the century, exports constituted 35% of the Icelandic GDP on average and mostly from fish. The share of fish products in total exports has fallen in recent years due to the emergence of tourism as Iceland's third economic pillar, along with fisheries and aluminum smelting. The industry still remains one of Iceland's most important, constituting 26.7% of total exports in 2020 (Radarinn, 2021).

Iceland is the 17th largest fishing nation considering ocean live capture, even though it is 177th in population. Moreover, the nation exports roughly 98% of its production of fish. Even though the supply of fish is high around the world which makes imports of Icelandic fish less important for other economies than the exports are for Iceland. Iceland is a small player for the rest of the world which makes them vulnerable and forces them to adapt terms that are set by others. Iceland has to make their hand fit into the glove regardless of if it is a good fit or not (Radarinn, 2021; Food and Agriculture Organization of the United Nations , 2022; Central Intelligence Agency, 2022).

It is estimated that around 10% of the Icelandic labor force works within the fishing industry. There is also qualitative evidence for the major impact on Iceland's economy from the fishing industries. Almost all villages along the coast were established for fishing purposes and still today, the industry is a major employer outside the capital with 18 of the 20 largest fishing companies situated outside Reykjavik (Agnarson and Arnason, 2008).

These matters of facts stated above once again emphasize the importance of the fishing industry not only for the development of the Icelandic economy, but also the influence the industry has had on the entire Icelandic society.

Iceland uses the Icelandic Króna (ISK), the smallest currency in the world backed by the Central Bank of Iceland and its inflation target. As Andersson and Jonung (2018) note prior to inflation targeting, Iceland has tried various monetary policy approaches, all of which failed resulting in 16.4 percent inflation on average per year between 1935 and 2001. The Icelandic economy is open but the domestic financial markets are limited which makes the economy exposed and sensitive to shocks from abroad. The characteristics of the Icelandic economy makes the exchange rate an important factor. Economic welfare can change considerably due to changes in the exchange rate (Andersson and Jonung, 2019; Magnússon, 2001).

As of end of year 2006 there were 167 firms that reported it's accounts using another currency than the Icelandic króna. It was possible to use another functional currency due to a law from 2002 and under strict restrictions. Restrictions were tested in 2007 when Kauping, Iceland's largest firm, applied for a permit to use the Euro instead of the ISK which the tax office allowed but starting in 2009, not 2008 as Kaupthing wished for. Following the 2008 financial collapse the restrictions were relaxed and as of 2016, 232 Icelandic firms use another functional currency than the Icelandic króna, providing 12.25% of collected corporated taxes in 2016 (Visir, 2007; Kaupthing, 2007; Pétursson, 2018).

In addition, from Frjals Verslun's 2021 list of 300 largest firms in Iceland, by turnover, five of the top ten firms do not use the Icelandic króna. Furthermore, Creditinfo's list of Strongest in Iceland, seven of the top ten firms use another functional currency than the Icelandic króna (Frjals Verslun, 2021; Creditinfo, 2021).

More and more evidence points out that countries with a stable currency, without heavy fluctuations, enjoy lower interest rates and therefore also lower required rates of return. By extension, this attracts more foreign investors. Recent exchange-rate studies have shown that policies for exchange-rate stabilization and spillovers from cross-border shocks are important for the allocation of capital (Hassan and Zhang, 2020).

Previously, there has also been evidence for domestic economic factors being affected by the commodity export prices in other small resource-rich OECD economies. Results like these are important for policy making, commodity hedgers and currency traders (Chen and Rogoff, 2003).

These factors together have made us interested in researching the fishing industry in Iceland with a special focus on the currency and possible currency substitutions. We believe that it is interesting to investigate how different companies treat risk factors that derive from the special characteristics of the domestic economy being heavily influenced by one single commodity which also has the characteristics of being common property.

1.3 Research questions

As mentioned above, our research field covers some different aspects. Our target is to give an elaborated view on currency substitution in the fishing industry in Iceland, and therefore our research questions are:

Is currency substitution an effective risk management tool?

Does the Icelandic króna negatively affect the Icelandic fishing industry?

1.4 Research purpose

Iceland, as a small country with its own national currency and a heavy load of exports thanks to its resource-rich environment, requires effective risk management from companies that want to defend themselves against uncertainty.

This thesis aims to give an elaborated insight into if currency substitution by the Icelandic fishing industry is an effective tool in mangaing risk. At the time of this thesis, 14 of the largest 20 fishing companies in Iceland use another functional currency than the Icelandic króna, a move originally described as a way to improve the firms' financial statements following the 2008 financial crisis (Adalsteinsson, 2010).

The problem comes with different aspects that affect the process. Currency exchange risk, purcahsing power parity, capital structure, risk management and exchange rate pass through are concepts that we will use to answer our research question together with relevant existing financial theories.

1.5 Aim and Scope

As mentioned above, our aim with the thesis is to give an elaborated view of risk management and currency substitution in fishing companies in Iceland. Iceland as a resource-rich emerging nation will give us an example of how currency substitution works in a country with unique characteristics as a risk management tool. We hope to provide a framework for establishing profitable companies in a resource-rich emerging nation amidst currency fluctuations.

We will implement a quantitative study with data from the 20 biggest fishing companies in Iceland.

2

Introduction to Fisheries Management in Iceland

2.1 Fisheries Management in Iceland

To analyze management in the fishing industry in Iceland there are a few concepts that need to be noticed before. For example, the fishing industry has since 1990 been regulated through policy with a system named Individual Transferable Quotas (ITQs) which are supposed to make it impossible to deplete the fish stock. Controlling the fish stock is problematic from a sustainable perspective since it is common property. The ITQ system gives fishers an individual quota, which is permanent and also can be leased or sold. This gives fishers in Iceland the incentive to take a long-term perspective on their activities (OECD, 2017).

OECD (2020) has also noted that Iceland is the only OECD country where government funded services for the fishery industry were consistently offset by revenue from the industry, coinciding with Deloitte's (2021) reports of the industry's margin improvement following the ITQ system's implementation (Deloitte, 2021; OECD, 2020).

There are several papers that describe the development of the ITQ- system. Arnason (1996) explained that the ITQ, or Individual Quota (IQ) system as it previously were called first, was implemented only on herring fishing in 1975 and was transformed to ITQ in 1979. The capelin industry followed with IQ 1980 and ITQ 1986. Demersal fishing had ITQ from 1984, and from 1990 all fisheries included in the Icelandic Exclusive Economic Zone (EEZ) operate within the ITQ system even though a few exceptions exist (Arnason, 1996).

In another paper, Arnason states that fisheries suffer from a problem of economic inefficiency which are referred to as the fisheries problem. Inappropriate institutions controlling the fishing industry are the root to this problem. Fisheries management aims to replace these institutions with appropriate ones. Which institution is most appropriate depends on which interest you have. An economist would argue that there is only one interest, to maximize the present value of the fish stock (Arnason, 2009).

Arnason has together with Hannesson and Schrank studied the phenomena further by discussing the common property problem from a management cost perspective. Management costs are defined as the costs of overcoming the common property-problem. The management's view on the business is the common property view while governments therefore have an unavoidable role as provider. Who is paying for the recovering costs are important. This, though, can be regulated through optimal taxation effects (Arnason et al., 2000).

It was found that Iceland has considerably lower management costs for fisheries, calculated as a percentage of the gross value of captured fish. In Iceland, management costs were around 3% while Norway had approximately 10% and Newfoundland up to between 15 and 25 percent (Arnason et al., 2000).

Another notable point of fisheries management in Iceland is wages. According to collective agreements, fishers are paid in portions of the catch they acquire while fishing (Samtaka fyrirtækja í sjávarútvegi (SFS), 2017).

3

Literature Review

Our theoretical background will consist of two chapters. In this chapter we present previously made research within the different aspects that we will use to elaborate and explain our empirical results.

3.1 Risk Management

Risk management in general, is a wide concept that generally contains the process of identifying and minimizing threats against your company. These threats can be to both the balance sheet, but also earnings. Threats can appear and affect both capital, costs and earnings. Paul Hopkin (2018) has divided risk management into four different parts. There are hazard risks, opportunity risk, control risk and compliance. Respectively, threats in these categories can be events that are threats to the goals of the company, threats against the firm's aim, threats against target achievements and compliance of the firm's mandatory obligations (Hopkin, 2018).

Handling of these first three categories of threats are mandatory for a successful risk management. They have to be monitored, controlled and evaluated. Further, risk management has to take place in the light of the company to be successful. The process for handling risk can be referred to as risk architecture and should contain architecture, strategy and protocols (Hopkin, 2018).

Risk management in emerging markets differs from developed ones. Emerging markets, which in general are a riskier place than developed ones, are more about making decisions with control rather than avoiding risks. It is a bigger issue for investors to put money in real assets rather than taking financial risks, in emerging markets. An aspect that shouldn't be underestimated is the factor of the cultural difference that can appear between an emerging market and a developed one. Risks that are common in an emerging market are currency risks, commodity price risks and interest rate risks (Olsson, 2002).

Exchange rate volatility has increased since the introduction of floating exchange rates, and the bigger the non-dollar debt a country has, the bigger the exchange rate risk. The root to commodity price risk are shifts in supply and demand. If a country is dependent on their commodities it makes them more sensitive to price

changes (Claessens, 1993).

Use of financial instruments is not uncommon in emerging nations, but it could harm the market. They can be insufficient for benchmark establishment which is important for transaction valuation. Without adequate benchmarks, estimations using benchmarks bear the risk of being bad. That can lead to, for example, a misestimation of future loss (Ramos et al., 2000).

3.2 Risk Management in Fisheries

Managers throughout the world, operating in fisheries, both aquaculture as well as wild capture face numerous risks. They not only face price and cost fluctuations as in other industries but they also face fluctuations in catch, risk of losing the right of use, and also substansive eco- and biological risks, involving stock depletion, degradation of habitat, pollution and climate change to name a few. Risks well known to Icelandic fishermen having to adapt to the collapse of the capelin stock in 2018 and the emerge of mackerel in the Icelandic EEZ in the early 21st century (Francis and Shotton, 1997; Marine Freshwater Research Institute, 2022; Marine Stewardship Council, 2022).

Sethi (2010) and Daramola (1989) have written about risk management in fishing industries and ways to manage the various risk facing the industry. Both agree that diversification, insurance and forward contracts and futures are effective measures in managing risks. Daramola specifically notes flexibility, how easy it is for the firm to adapt to changes and liquidity, in order to take advantage of changes as well as providing a financial buffer (Daramola, 1989; Sethi, 2010).

While Sethi mentions vertical and horizontal integration and a financial buffer to retain risk. Using vertical integration in order to reduce exposure to market risk by internalizing the value chain, by investing in own processing facilities and establishing own sales office. Horizontal integration in the fishing industry includes cooperation of firms at a similar stage of production, for example sales and marketing cooperative, like the Icelandic Freezing Plants Corporation and The Union of Icelandic Fish Producers used to be. For a risk that is not avoided, transferred or controlled it is then retained according to Sethi (2010). For retained risks there are two options, prepare to bear a possible loss, building a buffer to absorb the loss, or do nothing (Icelandic, 2022; Iceland Seafood, 2022; Gudmundur Kristjansson , 2012; Sethi, 2010).

3.3 Foreign exchange risk

When studying foreign exchange risk, there are several important concepts to keep track of. There are both visible and invisible threats against companies, but firms tend to only act against the visible ones. A risk that is less obvious can many times harm a company more since it is hard to manage. An example of a risk like that is the risk that derives from a mismatch between revenues in one currency, and investments and expenses in another currency (Goedhart et al., 2015; Hommel, 2003).

Big transactions with developing countries can be treated with hedging instruments such as currency swaps, options, or futures. Though, every currency risk cannot be treated with those instruments. A purpose of the use of real options is to create operational flexibility. This gives the possibility for operational hedging which can be helpful as a complement to other financial hedges to minimize variance. Operational flexibility can also be used as a value driver for the firm, which can be utilized by the firm regardless of its effect on risk management (Goedhart et al., 2015; Hommel, 2003).

A lesson that is really important to learn is the fact that all currency risk can not be managed. Therefore it is important to make a rational choice about which specific currency risks you should try to treat. Factors that affect this decision-making can be either behavior from competitors or macroeconomic trends that differs between countries (Goedhart et al., 2015).

Further, currency risk can be divided into different types of risks. There is portfolio risk, transaction risk and structural risk. They affect cash flows in different ways and therefore have to be treated in different ways. A company operating with different currencies bears portfolio risk. If prices are set in a foregin currency without taking changes in the exchange rate into account, the earnings will fluctuate alongside the local currency. This kind of risk rarely causes financial distress since it can be treated using futures (Goedhart et al., 2015).

Structural risk occurs when a company's respective in- and outflows of cash react differently due to currency fluctuations. If you have expenses in one currency and income in another, you are exposed to both portfolio and currency risk. This leads to changes in your net cash flow. Structural risk can lead to financial distress by turning positive cash flows negative. Inflation could save this phenomenon but it can take a long time. Due to the cash flow mismatch, structural risks are the hardest currency risk to manage. This problem can not be treated with financial instruments either if the duration or exposure are too heavy. The method to face this problem is to mitigate the mismatch as much as possible. Handling transaction risks is not problematic since the use of financial instruments for a transaction is clearly defined and often short-term. Programs for hedging are common among companies (Goedhart et al., 2015).

When deciding which currency risk, the focus should be on the risk that could lead the company into financial distress. When deciding which risk the focus should be on and how much currency risk that can be acceptable for the company, it is a similar process as when deciding about the capital structure. The driving factor in the decision is, as when deciding how much debt you can allow in the company, how much currency risk you can allow. That depends on how risk-averse the managers are. Measurements for that could be how much cash flow is at risk, a maximum probability for default, or a specific credit rating. For currency risks lacking hedging alternatives, a benchmark could be to have a capital structure less leveraged than peers (Goedhart et al., 2015).

3.4 Price Hedging

One of the most common ways to deal with different market risks is through hedging. Hedging can be specified as two coincident transactions in markets where the transactions will end up even. A gain in the first market will be offset by a similar loss in the other market, and vice versa. The most common way of hedging is when you buy the same product both on the spot- and the futures market. Though, you can also hedge for example different commodities against each other. It is important to understand that the spot- and the futures market are two completely different markets. Hedging is expected to give full protection against adverse price changes (Hardy and Lyon, 1923).

The use of futures has been present since the 17th century but up until 1945 most of the literature mostly described and explained what futures contracts are, and how they are traded. After World War II you can see an increase in literature and also that it is more elaborated and comprehensive (Johnson, 1976).

Commodity futures markets are common and for every single one, there is also a parallel market existing for the trade of the commodity in the present time. With bigger markets for futures, there is also a bigger impact on the spot market. Parameters that are affected are for example production levels, marketing, and storage. A transaction on a future market is generally characterized by a large amount of a specific commodity. An important difference between a futures market and the spot market is that the futures market can be used only as a paper market, without the need of ever seeing the actual product sold or bought (Johnson, 1976).

3.5 Commodity Price Hedging

Price hedging and commodity price hedging has been researched comprehensively during the ages. There are companies that are exposed to uncertainty both for commodity prices and exchange rates. There are differences between the two types of hedging. The hedging for commodity prices is independent of the exchange rate hedge but the exchange rate hedge depends on the commodity price hedge and the forward market of the commodity. This applies if you aim for the optimal currency hedge. The level of production is independent of its objective function with forward markets for one or both desired hedges existing. Though, the production function is affected by the unhedgeable risks of consumption betas (Benninga et al., 1985).

Proof of utility maximizing has been found by a full hedge in both foreign exchange and commodity as long as unbiased independent forward markets exist in both categories. If there is only a forward market existing for the commodity the optimal rational choice from the firm would be to once again fully hedge against it and to over hedge if the market has a negative risk premium. With a positive risk premium, the optimal choice is to under hedge. With a missing forward market for commodities, you can not estimate the optimal quantity produced in a case with a full hedge. The optimal produced quantity is reduced due to unhedgeable risks. A political guarantee programme for exchange rate will increase the export if the producer has an unbiased commodity forward market available. Though, this means

that if a commodity forward market is missing the introduction of an exchange rate guarantee programme will lower exports (Benninga et al., 1985).

Commodity futures can be used as either hedging or speculation. When a future market for a specific commodity exists it will be preferable for an actor to use it rather than buying an asset at the spot market, holding it and hoping for the value to increase, and also instead of with private negotiations, selling the asset short (Johnson, 1976).

3.6 Functional Currency

The term functional currency is defined in IAS 21, International Accounting Standards, as "the currency of the primary economic environment in which the entity operates" while Jankensgård, Alviniussen, and Oxelheim (2020) defined it as "the currency in which a legal unit measures and reports its financial performance (International Financial Reporting Standards, 2022; Oxelheim et al., 2020).

In their book, Jankensgård, Alviniussen, and Oxelheim (2020) use functional currency as a synonym for home currency, the currency of the country in which the firm is incorporated. A logical action, however, not applicable everywhere. As Fernández, Pino, and Vásquez (2020) noted when studying the relevance of firms using the USD as their functional currency. They concluded Chile had the highest portion of USD presentation or total assets presented in USD as 64% of GDP while countries like Canada, Norway, and the United Kingdom also reported a high portion of USD presentation (Oxelheim et al., 2020; Fernández et al., 2020).

In February 2007 regulation 101/2007 on granting permits to keeping accounts and presenting annual reports in foreign currencies was signed. According to the regulation, firms would need to fulfill one of four criteria and apply for a permit to use a foreign currency as its functional currency. Among the criteria necessary was if a firm's main operations take place abroad in a foreign currency and if a firm's income is earned from foreign entities using foreign currencies. The regulation also defines the functional currency as the currency that weighs proportionally most in the firms' operations. Although firms could apply to use a foreign functional currency since 2002, the 2007 regulation relaxed the criteria (Árni M. Mathiesen, 2007; Einarsson and Sturluson, 2008).

Einarsson and Sturluson (2008) wondered about the possibility of firms and the Icelandic public to unilaterally euroize against the government's will while noting that some of the largest firms in Iceland at the time had either officially applied to use the euro as their functional currency or had already switched from the Icelandic króna to a foreign currency, either the euro, the British pound or the US dollar. As a reason for the change, the fluctuations in the exchange rate of the Icelandic króna were mentioned (Einarsson and Sturluson, 2008).

Einarsson and Sturluson (2008) also pointed out advantages to firms that change their functional currency to the euro. Most notably that the change would result in greater stability in earnings and equity. (Einarsson and Sturluson, 2008).

4

Financial Theories

This is the second part of ou theoretichal background. In this chapter we present the theoretical frame and highlight well established financial theories that can explain decision making within companies.

4.1 Modigliani-Miller Theorem

The Modigliani-Miller theorem was founded in 1958 by Franco Modigliani and Merton H. Miller. The theorem consists of two propositions. The first proposition states that two identical companies on all aspects will have the same firm value and same cost of capital. This is valid regardless of how much of the firm is financed with debt or equity. The second proposition states that a positive relationship is in place between cost of equity and leverage, as a company assumes more debt its cost of equity rises in line with the increased risk. The weighted cost of capital however remains the same (Modigliani and Miller, 1958).

Miller and Modigliani's theorem is based on the assumptions of a perfect market as well as individuals and firms can assume debt with the same interest rate and disregard transactions costs and financial distress costs. The theorem also misinterpreted the effect taxes have on net income given that interest expenses are deducted from income prior to taxes being calculated, a problem Miller and Modigliani corrected in their 1963 paper (Modigliani and Miller, 1963).

The Modigliani-Miller theorem was elaborated by Joseph E. Stiglitz in his report from 2005. Stiglitz describes the cost of capital as the most important part deciding a firm's investment level. Since most investments are within companies, the cost of capital for companies are interesting to decide. Historically this has been a subject of economic confusion since the return on equity is not equivalent with the return to bonds. With those assumptions it is important to decide which is the important cost, and if it does affect the firm's financing at all (Stiglitz, 2005).

The conclusion of the theorem is that the policy from the management does not matter. The firm value will remain the same ceteris paribus regardless of how the firm is financed. A consequence of that was that the cost of capital was not affected by the cost of capital. Though, three different parts were left out of the theorem. It

was tax effects, risk for bankruptcy and asymmetric information (Stiglitz, 2005).

When considering the Modigliani-Miller propositions together with the fishing industry in an emerging market such as Iceland it is interesting with the fact of differences whether a specific company is listed on the stock market or not. If listed, it is easier for the company to seek equity capital and by that reducing leverage. According to the propositions, this should not make any difference for the enterprise value of the company and therefore, it is uninteresting whether the company is listed or not. Though, this is based on the fact of perfect capital markets, which we know emerging nations can lack of.

Another interesting matter to take into account when deciding whether to be listed or private, is connected to the functional currency. We know that emerging markets are more volatile both politically and financially. The use of EUR or USD as functional currency could reduce the national interest in the company and therefore reduce demand for the stock. Therefore, considering which market to be listed at if you want to list your company could be important.

4.2 Pecking Order Theory

Miller and Modigliani (1963) noted that even though the benefits of the tax shield indicated that managers should maximize the company's leverage it wouldn't necessarily happen. In some cases retained earnings could be a more affordable funding option than debt. Not to mention that bond covenants and other limitations a firm's lenders implement (Modigliani and Miller, 1963).

In Myers and Majluf (1984) paper they introduce the pecking order theory as a fault of information asymmetry. Managers have superior information about a firm and when they face a positive net present value project they do not aim for optimal capital structure and avoid issuing new equity at all costs as it tends to have a negative price effect. Managers therefore defend the interests of its current shareholders. Managers rely on retained earnings and low risk debt and will even go as far as abandoning a profitable investment instead of issuing equity (Myers, 1984; Myers and Majluf, 1984).

This theory is more in line with unlisted Icelandic fishing companies. Using retained earnings and debt are a better strategy for unlisted firms and due to the lack of possibilities for new equity capital the capital structure of an unlisted Icelandic fishing company could be explained well with the Pecking Order theory. For smaller companies, that are assumed to be common in an emerging market it is also preferable a capital structure based lower with low risk- debt, earnings or usual debt rather than public equity. An argument for that can be that the financial markets in emerging nations are more volatile than in developed ones.

4.3 Trade off Theory

As noted in the previous subchapter Miller and Modigliani did not include bankruptcy costs in their propositions. Alan Kraus and Robert H. Litzenberger (1973) did so when they introduced the trade off theory. Their conclusion was that the value of a firm was equal to the value of an unlevered firm added to the tax shield less the corporate tax rate times the present value of expected financial distress costs. Firms must then decide what capital structure is optimal dependent on the positive tax effect higher leverage has as well as negative financial distress higher leverage has. In effect the optimal capital structure should then be where the marginal rebate from the tax shield equals the marginal bankruptcy costs, maximizing the firm's value (Kraus and Litzenberger, 1973).

The trade off theory should explain why companies with greater tangible assets tend to have more leverage since bankruptcy costs not only consist of the probability of bankruptcy but also the value possibly lost in case of bankruptcy (Myers, 1984).

The fishing industry in Iceland has a lot of intangible assets. This should, according to the Trade- off theory, entail that equity is a highly prioritized source of financing. This should then be a problem for firms that are not listed, since the availability of equity capital is reduced. More equity though, reduces the utility of the tax shield, so this is a financing puzzle with both possibilities and constraints that depend on the demanded policy of the firm.

4.4 Enterprise Risk Management (ERM)

Enterprise risk management is defined as the holistic view and management of risk in a company. If risks are managed in a holistic way you can achieve efficiencies when creating shareholder value. To be efficient and value creating ERM should be coherent management of risks that influence the whole organization. Another part of ERM is to get knowledge and understanding about how different risks interact with each other (Myers, 2016).

One of the most basic concepts of ERM is the implementation of risk preferences in a company. These are defined as risk tolerance and risk appetite. Risk appetite is the level of risk that the company is willing to take given an estimated outcome. Risk tolerance is the level of risk appetite accepted to remain on the company's balance sheet. Notable are the differences in statistical characteristics with risk tolerance being quantitative and risk appetite qualitative (Myers, 2016).

ERM has developed to be a concept of senior character. This hasn't always been the case but risk management has been elevated higher up in organization hierarchy. There are different types of risk according to ERM which all follow the same handling process. The different risk types are hazard risks, financial risks, operational risk and strategic risk. Exchange in foreign currency is a common financial risk (CAS ERM Committee, 2003).

The process of enterprise risk management involves the following steps. First of all you establish context. Then you identify risks before analyzing and quantifying them. Then you integrate the risk which means that you express the effect on the firm's indicators of performance from the identified risks. Finally you prioritize these risks and then you treat them in the best way possible. This can be both to exploit the risks but also to mitigate or remove them if possible. It is important that you during all steps of the process monitor and review. That is made through regular measurements of both the risk strategies used but also of the risk environment. When monitoring and reviewing you can also identify different risks possible to scale over time (CAS ERM Committee, 2003).

4.5 Exchange Rate Pass-Through (ERPT) and Purchasing Power Parity (PPP)

The interest for exchange rates and its relationship to prices increased in the 1970ths not only to review the validity of the theory of Law Of One Price but also to investigate the effect on currency fluctuations to inflation and payment balance. The theory is defined as how much change with one percentage in the exchange rate affects the import price in local currency in percentage. This, in economic terms, is the elasticity for import price compared to the price of a foreign currency (Menon, 1995).

Purchasing Power Parity (PPP), a term coined by Gustav Cassel (1918), is a theory of how exchange rates are determined. The theory states that the change in the exchange rate is due to the change in the two countries' prices for a given good. Essentially upholding the Law of One Price. Dornbusch (1985) noted that after a significant monetary disturbance, the cumulative change in money, prices, and the exchange would be the same or roughly the same, upholding PPP. The theory is controversial and in its strictest sense has been rejected, and the mean reversion has been explained due to arbitrage. There are some papers in which a softer PPP has gained attraction. The parity, however, does not happen overnight; instead, over a long enough time horizon (Cassel, 1918; Dornbusch, 1985; Haskel and Wolf, 2001; Fernández et al., 2020)

The theory assumes two conditions. First, the markup of price over cost is assumed to be constant. The markup is often assumed to be zero and the competitive markets are assumed to be under perfect conditions. The second condition is that the marginal costs are constant (Menon, 1995).

The ERPT-theory has been tested by Campa and Goldberg (2005) and they found evidence that, in the short run, is compelling but partial. This result was even more obvious in the manufacturing industry. In the long run it is more usual to have currency pricing from the producer for goods that are imported. The pass-through elasticity is bigger for countries with higher volatility in exchange rates but macroeconomic factors are not a severe determinant for this phenomena. The big determinant and driving force for pass- through elasticities are big shifts in the mixture of the import bundle in a country (Campa and Goldberg, 2005).

Studies by Asgeirsson (2011) and Edwards and Cabezas (2020) have shown the Exchange rate pass-through coefficient in Iceland to have been roughly 0.4 and falling to 0.23 following a credible change in the country's monetary regime (Asgeirsson, 2011; Edwards and Cabezas, 2020).

5

Hypothesis Development

5.1 Hypothesis development

In order to answer our research questions we have formulated a couple of hypotheses.

As a reason given for changing the functional currency is to minimize the effect fluctuation in the ISK has on operations, we put forward the following hypothesis:

Hypothesis 1 (H1):

There is a negative relationship between the ISK being the functional currency in annual reports and earnings.

In order for the currency substitution to provide as a good risk management tool we place forward the following hypothesis:

Hypothesis 2 (H2):

Volatility of EBITDA is less for firms using the Euro or the Dollar as it's functional currency.

As intangible assets assume a more significant share of total assets, firms funding with debt reduces, coinciding with Berger and Udell (1998) and Michaelas, Chittenden and Poutziouris (1999) concluded that firms with more fixed assets are able to borrow more, having preferable collateral in fixed assets (Berger and Udell, 1998; Michaelas et al., 1999).

Therefore we place forward the following hypothesis:

Hypothesis 3 (H3):

There is a negative relationship between intangibility and debt..

6

Method

In this chapter the method that we have applied for our study are presented. We explain the sample selection, the empirical design and we give brief explanations to our variables used.

6.1 The Approach

In writing this thesis, a quantitative method has been used. A quantitative research method uses a numeric approach treated with empirical design. The research should be independent of the researchers. There are three different categories of quantitative studies, comparative, experimental, and descriptive (Williams et al., 2007).

The approach of our study has been deductive, as described by Newman (2000). A deductive quantitative method can also be referred to as theory testing (Newman, 2000).

As described by Savela (2017) there are both advantages and disadvantages to both qualitative and quantitative research methods. Quantitative methods reduce the impact of current trends, which are included in qualitative research methods. On the other hand, quantitative methods stabilize the results by removing inaccurate generalizations. Though, a qualitative method can give you more detailed results. Using a quantitative method there is a certain limit where an item cannot be further investigated (Savela, 2018).

The empirical methods used in this thesis are ordinary least squares, fixed effects and random effects, and standard errors, clustered standard errors as well as robust standard errors.

We have also made a Hausmann test to check if the regressions are exogenous or endogenous. We also made a Breusch-Pagan test and a White's test to check for Homo- or Heteroskedasticity. We also performed VIF-checks to test for multicollinearity in our models. We also winsorized our data in order to test for and smooth out outliers at the 1st and 99th percentile level without seeing a difference in our results. Our dataset contains companies from several different years, i.e we have panel data.

At the beginning of the process, we discussed whether we should use a quantitative or qualitative approach. Though, the pros of a quantitative method exceeded the pros of a qualitative method. This was because of the reduced risk for biased estimators using the quantitative method. Since we wanted to investigate data over decades the quantitative method is better from that perspective as well. This is because a quantitative method reduces the impacts of trends, as mentioned above.

To assess our data according to the abovementioned quantitative approach we have used the software STATA. In STATA, we have made a OLS Regressions as mentioned above. To control for errors in estimation we have also made regressions with robust standard errors and robust standard errors clustered by firm. These results will be presented in Chapter 6.

6.2 Sample selection

Our sample has been chosen from size related to the percentage of the total allowed catch (TAC). Our sample includes 85.17% of the TAC. Since we have included such a big part of the population in our sample most of the market is represented. This makes sure that our sample couldn't suffer from selection bias influential to the results.

6.3 Variable description

In total, our investigation includes fourteen different variables as described below.

EBITDA

EBITDA is a common financial metric from the income statement and stands for earnings before interest, taxes, depreciation and amortization. As values for EBITDA was in three different currencies in our dataset, ISK, USD and EUR we converted each company's EBITDA from its functional currency to the Euro both for simplicity as well as comparability. For the conversion, we used the yearly average value of EUR/ISK and EUR/USD.For model (2) we used the one year lag of EBITDA.

Functional currency

We created three dummy variables, for each currency used as the functional currency, to assess if the firm's functional currency affects its performance in any way. If the functional currency in the annual report was EUR that year would get a value of 1 while USD and ISK would get 0 for example.

Leverage

A variable defined as total debt divided by total assets. As noted in Adalsteinsson (2010), the effect on equity following the substitution of the functional currency amounted to billions of ISK, therefore reducing leverage.

Intangibility

Commonly a variable called tangibility is created as fixed assets divided by total assets. In this thesis, due to the nature of the ITQ system, we deem intangibility to be a better variable. We define it as Intangible ITQ divided by total assets.

Cash ratio

The cash ratio is calculated as cash on the balance sheet divided by total assets. As mentioned by Sethi (2010) a financial buffer is a way firms are able to deal with risk, therefore the evolution of the cash ratio is an interesting variable.

Oil price

Oil expense is one of the greatest cost for fisheries companies and with it, the volatility of oil prices is a key risk factor.

Central bank main rate

The main rate that is set by the central bank. In our thesis, the main focus is on the Icelandic main rate, set by the Icelandic central bank.

The central bank has used it's main rate to curb inflation with mixed results. The main rate also has the possibility of affecting the Króna's exchange rate as seen prior to the 2008 financial crisis with significant amount of money gathering in Iceland for carry trade using the so called "Glacier bonds" (Maidment, 2008).

Inflation

The change in the annual average consumer price index. Iceland has an inflation target of 2.5% (Central Bank of Iceland, 2022).

As previously noted studies point to countries having stable currencies enjoy lower interest rates and inflation and therefore attracting foreign investment. Iceland however has long had problems with inflation as noted and visible thorugh it's high ERPT value.

EUR/ISK

The exchange rate for Euros and the Icelandic Króna i.e. the amount of ISK needed to buy one Euro. Likely the most important exchange rate for Icelandic fisheries as 50% of the firms in our sample use the Euro as their functional currency and the European Union is the largest purchaser of Icelandic fish products (The Government of Iceland, 2021).

USD/ISK

The exchange rate for the US Dollar and the Icelandic Króna i.e. the amount of ISK needed to buy one US Dollar. A large portion of companies in pelagic operations use the US dollar as their functional currency as well as most firms buy oil in USD.

GBP/ISK

The exchange rate for the British Pound and the Icelandic Króna. Although none of the fisheries companies in our sample use the GBP as their functional currency the United Kingdom is by far Iceland's largest single trading country with fish products (The Government of Iceland, 2021).

USD/EUR

The exchange rate for Euros and the US Dollar i.e. the amount of Euros needed to buy one US Dollar. A necessary exchange rate since most firms buy oil in USD.

Earnings volatility

Earnings volatility, our risk metric, is defined as the percentage change in EBITDA between years. For models (1) and (3) we used the one year lag of EBITDA volatility.

Fish price

A major part in the industry is the price available for their product. There are no easily accessible databases, not to mention the many different types of prices available for a single fish, depending on size, species and if the fish has been gutted or headed. So our proxy for fish price is the total value of fish products exported from Iceland divided by the total amount of fish products exported from Iceland. Using this proxy we encompass the average price for all different products, from filets to fish meal and capelin roe.

6.4 Empirical design

Using the aforementioned variables we put forward the following equations. Using model (1) we hope to answer H1, using model (2) we hope to answer H2, and using model (3) we hope to answer H3.

Model (1):

$$\text{EBITDA(eur)}=\beta_0+\beta_1 Intangibility+\beta_2 Leverage+\beta_3 Lagof EBITDAvolatility+\beta_4 CashRatio+\beta_5 OilPrice+\beta_6 CentralBankRate+\beta_7 Inflation+\beta_8 FishPrice+\beta_9 DummyforISK+\varepsilon$$

Model (2):

$$EBITDAvolatility=\beta_0+\beta_1 Intangibility+\beta_2 Leverage+\beta_3 Cashratio+\beta_4 OilPrice+\beta_5 CentralBankRate+\beta_6 Inflation+\beta_7 FishPrice+\beta_8 DummyforISK+\beta_9 Lagof EBITDA+\varepsilon$$

Model (3):

$$Leverage = \beta_0 + \beta_1 Intangibility + \beta_2 Dummy for ISK + \beta_3 2001 + \beta_4 2002 + \beta_5 2003 + \beta_6 2004 + \beta_7 2005 + \beta_8 2006 + \beta_9 2007 + \beta_{10} + 2008 + \beta_{11} 2009 + \beta_{12} 2010 + \beta_{13} 2011 + \beta_{14} 2012 + \beta_{15} 2013 + \beta_{16} 2014 + \beta_{17} 2015 + \beta_{18} 2016 + \beta_{19} 2017 + \beta_{20} 2018 + \beta_{21} 2019 + \beta_{22} 2020 + \beta_{12} Lag of EBITDA volatility + \varepsilon$$

6.5 Validity

In concrete terms validity means that you measure what you really intend to measure. The simplest way to decide if a study is valid is to measure whether face validity exists or not. Face validity exists if the measure correlates strongly with the concept in question. That is measurement validity. In quantitative studies internal validity is important as well. That is, briefly explained if you can be sure that the stated impact on the dependent variable from an independent variable really exists, and that the impact is not derived from some other factor (Bryman, 2016).

In our study we have measured what we intended to measure. That has been done with the abovementioned equations. To make sure that our investigation has face validity we have used basic, well known variables that are described in literature connected to the concept. These basic economic variables like EBITDA, leverage, intangibility and different exchange rates intiutively are assumed to reflect risk management amidst currency fluctuations.

Our variables represent the concept in a satisfactory way and that should make our results representative for the research questions and hence fulfill the aim of this thesis.

6.6 Reliability

The concept reliability comes from whether the result of the study would be the same if it was studied by another researcher using the same method. Reliability in a quantitative study can be measured as the stability of the results, i.e if the results are reliable. Reliability is closely linked to replicability, i.e. if the study are possible to repeat (Bryman, 2016).

In our study we have used data from a sample that represents approximately 85% of the market investigated. The basic assumption of that fact should be that the results are stable and strongly reliable. We have also made different measures when processing our results, as mentioned above. A researcher using a similar quantitative method for the Icelandic fishing market should therefore receive a result similar to ours.

7

Data Collection

In this chapter, the characteristics of the whole sample are first presented as well as how they were gathered. Then, descriptive statistics for subsets of the sample are discussed.

7.1 Data Description

The data we collected came from various sources. We first collected data on the total allowed catch by firms from the Icelandic Directorate of Fisheries for the fishing year 2021/22 (Icelandic Directorate of Fisheries, 2021). We sought the top 20 companies. One of those companies, Runolfur Hallfredsson ehf. (RH) was merged with another one, Sildarvinnslan hf., in late 2021 and its operations discontinued so we included the 21st firm, Jakob Valgeir ehf. instead of RH. The firms in our sample were as seen in table 7.1. These companies combined comprise 85.17% of all TAC in Iceland (Fiskistofa, 2021).

Name	CET	TAC %	No. Reports
Brim hf.	79 582 185	13,20%	18
Ísfélag Vestmannaeyja hf.	60 582 852	10,05%	18
Síldarvinnslan hf.	56 692 292	9,41%	19
Samherji Ísland ehf.	48 772 660	8,09%	18
Vinnslustöðin hf.	42 042 767	6,98%	18
Skinney-Þinganes hf.	35 762 786	5,93%	19
Eskja hf.	29 888 380	4,96%	17
FISK-Seafood ehf.	20 489 093	3,40%	18
Þorbjörn hf.	17 219 788	2,86%	19
Rammi hf.	15 496 746	2,57%	17
Gjögur hf.	15 274 698	2,53%	19
Útgerðarfélag Reykjavíkur hf.	13 438 409	2,23%	19
Vísir hf.	13 033 859	2,16%	18
Hraðfrystihúsið - Gunnvör hf.	10 914 225	1,81%	20
Nesfiskur ehf.	10 873 612	1,80%	18
Loðnuvinnslan hf. Fáskrúðsfirði	10 366 633	1,72%	18
Runólfur Hallfreðsson ehf.	8 177 057	1,36%	N/A
Útgerðarfélag Akureyringa ehf.	6 493 193	1,08%	9
Huginn ehf.	6 363 631	1,06%	19
Bergur-Huginn ehf.	6 187 788	1,03%	18
Jakob Valgeir ehf.	5 700 897	0,95%	12

Table 7.1: Distribution of total catch

As these companies represent 85.17% of TAC in Iceland, we believe the sample is a relatively good metric for the population and can therefore be used to provide a good framework for other countries. After deciding on the companies, we gathered annual reports for them from 2020. The oldest annual report was from 2001; in total we gathered 351 annual reports with reports per each company ranging from 8 to 20, with an average of 17.55 reports per firm. We also gathered data on ex-

ported fish, both value and amount, and the Icelandic Consumer Price Index(CPI) from Statistics Iceland. Using Factset, we gathered data on Brent Crude Oil, the continuous variant, and EUR/USD exchange yearly average. Finally, we gathered data from the Central Bank of Iceland data of the yearly average of the Central Bank's main rate and the exchange rates of the Icelandic Króna and the Euro, the US Dollar as well as the British Pound, for the years 2001 until 2020. The data set gathered resulted in 4 201 individual data points. We amended, EBITDA, total assets, intangible ITQ, cash, total equity, and total debt, variables, containing monetary units, to show units in thousands.

There are numerous faults in the data. Firstly, TAC, calculated in CET, varies between years and, therefore, the list's ranking. For example, for the fishing year 2021/22, the Marine Freshwater Research Institute's (2022) recommended capelin TAC of 869 000 tons, following no quota in 2018/19 and 2019/20 and 127 300 tons in 2020/21, heavily distorted the ranking and thus which firms landed in our sample. Another fault in the dataset is the irregularity in the number of reports for each company; of 351 reports, 180 reports consist of the entire 20 company list mentioned above. This fault is partly due to Samherji's acquisition of UR's (then Brim) operations in Akureyri, renaming them UA, in 2011, and the transfer of old Jakob Valgeir's operations to another firm in 2009 (Marine Freshwater Research Institute, 2022; Samherji, 2011; Vilhjalmsson, 2009).

Another reason for this fault is due to how difficult it is to access private companies' annual reports in Iceland for many years in the past. Another fault in our data is that most of our data points depend on the accounting standards and bookkeeping laws at each specific time. An example of a mismatch due to accounting standards is that for a few years, it was standard to depreciate the firms' ITQ, which would affect the firms' leverage as well as intangibility. This specific mismatch was however amended. The authors can not identify other faults due to different accounting standards; that does not mean there could be any. Another fault in the dataset, a side-effect of having panel data over more than a decade, is numerous changes in the organization of the firms. Examples of changes in the company structures are the decision by Samherji to split its foreign and Icelandic operations, Gjögur splitting its investments and fisheries operations, UR selling its operations in Akureyri and later buying a significant share in Brim, to name a few (Samherji, 2011, 2013; Útgerdarfélag Reykjavíkur hf., 2019; Gjogur, 2016).

These are changes that directly affected at least two of our key independent variables, leverage, and intangibility.

7.2 Descriptive Statistics

As mentioned above, we gathered 351 annual reports. As seen in table 7.2, of those 351 reports, 102 reported using the Euro as their functional currency, 202 reported using the Icelandic Króna as their functional currency, and 47 reports in which the US dollar was the functional currency.

Functional Currency	No. reports
Euro	102
ISK	202
USD	47
Total	351

Table 7.2: Descriptive statistics of annual reports gathered

However, that does not give a complete picture of the evolution of what currency has been the functional currency for the firms. In table 7.3, the percentage distribution of which currency is used can be seen. Notably, in two years, the share of companies using the ISK as their functional currency fell from 100% in 2007 to 47% in 2009. As of 2020, 50% or 10 of the 20 companies in our sample use the Euro as their functional currency. 20% use the US dollar as their functional currency, while 30% of firms still use the ISK as their functional currency.

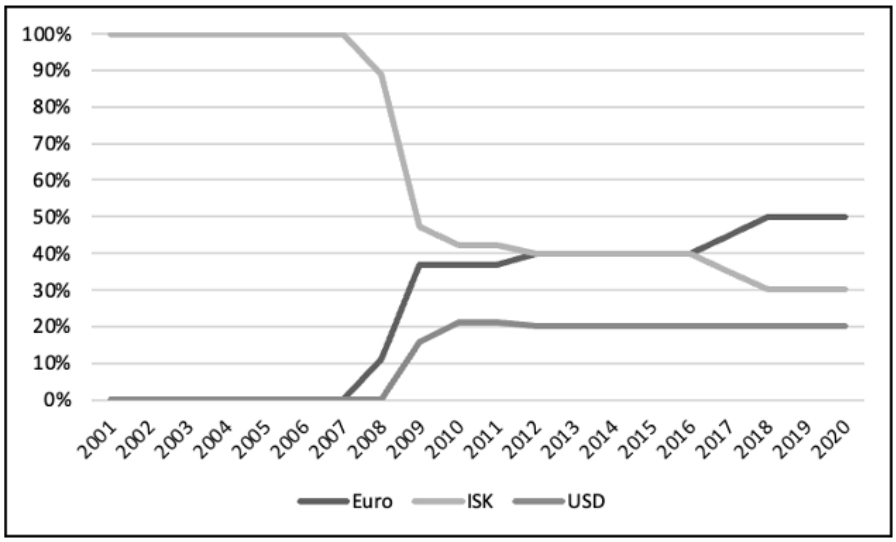

Table 7.3: Percentage distribution of functional currency

Table 7.4 describes the descriptive statistics for our key variables. In the table are the number of observations, mean, standard deviation, median, minimum, and maximum values of the fifteen variables mentioned before and four additional variables. The four additional variables shown in table 7.4 are EBITDA, whose report used the EUR as its functional currency and its volatility, and EBITDA, whose report used the USD as its functional currency and its volatility. The mean observed EBITDA, converted to EUR, was €15.359 million with a standard deviation of €12.889 million. The observed mean leverage was 0.665 with a standard deviation of 0.260. For intangibility, the mean was 0.459, and the standard deviation was 0.203. The volatility of EBITDA converted to EUR, i.e., volatility of a firm's earnings from all 351 reports, had an observed mean, from 331 observations, of 0.162 and a standard deviation of 0.618. Compared to the volatility of EBITDA, whose functional currency was the Icelandic króna, a mean of 0.301 and a standard deviation of 0.846,

and whose functional currency was the Euro, a mean of 0.082 and a standard deviation of 0.404, and whose functional currency was the USD, a mean of 0.098 and a standard deviation of 0.480. Therefore, it is clear that the volatility of earnings reported in ISK heavily distorts the volatility of EBITDA converted to euros.

Variable	Observations	Mean	Std. dev.	Median	Min	Max
EBITDA conv. EUR	351	15359	12889	11639	569	74865
Vol. of EBITDA conv. EUR	331	0.162	0.618	0.041	-0.745	4.663
Lag of EBITDA	331	15183	12769	11364.1	568.512	74865
Lag of EBITDA vol.	311	0.660	19.96	-1.212	-0.745	281.83
Leverage	351	0.665	0.260	0.639	0.046	1.800
Intangibility	351	0.459	0.203	0.441	0.001	0.876
Cash ratio	351	0.042	0.052	0.026	0.000	0.423
Fish price (eur/kg)	351	2.327	0.436	2.318	1.621	3.061
Brent Oil	351	58.519	30.942	56.820	19.900	111.110
Central Bank rate	351	0.068	0.036	0.054	0.015	0.154
CPI %	331	0.044	0.031	0.039	0.016	0.124
EUR/ISK Yearly average	351	130.730	31.010	137.300	78.140	172.670
USD/ISK Yearly average	351	105.465	23.960	116.750	62.860	135.270
GBP/ISK Yearly average	351	162.225	28.610	163.800	114.260	201.580
USD/EUR Yearly average	351	0.812	0.081	0.804	0.683	1.117
ISK	351	0.575	0.495	1	0	1
EUR	351	0.291	0.455	0	0	1
USD	351	0.134	0.341	0	0	1
EBITDA(isk)	202	1344498	1164327	973345	49006	9767753
Vol. of EBITDA(isk)	183	0.301	0.846	0.055	-0.687	5.358
EBITDA (eur)	102	19417	14525	13957	2631	63906
Vol. of EBITDA(eur)	92	0.082	0.404	0.042	-0.745	1.972
EBITDA (usd)	47	28806	18967	24103	2345	76557
Vol. of EBITDA(usd)	43	0.098	0.480	0.047	-0.554	2.514

Table 7.4: Descriptve statistics of variables

Table 7.5 presents the sample's Pearson's correlation matrix. Table A.18 also presents Pearson's correlation matrix using the same variables as table 7.4 as well as denoting statistically significant correlation at the 1% level. Notable in the correlation matrix is the fairly weak but statistically significant negative correlation between EBITDA converted to EUR and both leverage and intangibility. Also notable is the strong, positive, correlation between leverage and intangibility. There is also a strong positive correlation between the exchange rates, EUR/ISK on one hand, and USD/ISK and GBP/ISK on the other hand. Unsurprisingly, the matrix shows a statistically significant strong positive correlation between inflation in Iceland and oil price and between inflation and the Central bank's main rate. Surprisingly the matrix shows, a strong negative correlation between oil prices and fish prices and a statistically significant positive correlation between oil prices and the Central bank's main rate. The latter is most likely explained by the correlation between inflation and the Central bank's main rate, as well as its above mentioned inflation target.

Correlation Matrix

Variable:	EBITDA conv. EUR	Leverage	Intangibility	Cash ratio	Fish price (eur/kg)	Brent Oil	Central Bank rate	CPI %	EUR/ISK	USD/ISK	GBP/ISK	USD/EUR	Vol. EBITDA conv. EUR	ISK	EUR	USD
EBITDA conv. EUR	**1.000**															
Leverage	-0.353	**1.000**														
Intangibility	-0.249	0.496	**1.000**													
Cash ratio	0.145	-0.310	-0.297	**1.000**												
Fish price (eur/kg)	0.205	-0.335	0.057	0.064	**1.000**											
Brent Oil	-0.032	0.404	0.046	-0.047	-0.538	**1.000**										
Central Bank rate	-0.106	0.430	0.034	-0.094	-0.516	0.800	**1.000**									
CPI %	-0.052	0.485	0.016	-0.006	-0.576	0.745	0.788	**1.000**								
EUR/ISK Yearly average	0.180	0.021	0.099	0.184	0.324	-0.053	-0.347	0.092	**1.000**							
USD/ISK Yearly average	0.187	-0.145	0.076	0.170	0.575	-0.355	-0.574	-0.194	0.912	**1.000**						
GBP/ISK Yearly average	0.170	0.044	0.097	0.163	0.228	0.056	-0.274	0.077	0.939	0.853	**1.000**					
USD/EUR Yearly average	-0.027	-0.365	-0.076	-0.046	0.435	-0.702	-0.499	-0.688	-0.270	0.137	-0.256	**1.000**				
Vol. EBITDA conv. EUR	0.083	0.073	-0.023	-0.004	0.010	0.069	0.079	0.042	-0.137	-0.132	-0.108	-0.007	**1.000**			
ISK	-0.354	0.275	-0.019	-0.087	-0.408	0.271	0.377	0.191	-0.483	-0.538	-0.403	0.092	0.111	**1.000**		
EUR	0.202	-0.110	0.234	-0.088	0.308	-0.205	-0.272	-0.130	0.352	0.395	0.287	-0.072	-0.100	-0.745	**1.000**	
USD	0.245	-0.252	-0.284	0.243	0.180	-0.121	-0.184	-0.100	0.232	0.254	0.202	-0.037	-0.026	-0.458	-0.252	**1.000**

Table 7.5: Correlation matrix

8

Results

In this section, we will present the main results of our empirical analysis.

8.1 Results

We tested our three hypotheses by using the three models, (1), (2), and (3) introduced in chapter four using conventional OLS regression, using clustered robust standard errors by firm. Before that we did a few diagnostic tests, testing whether our data needed winsorizing, whether it was homoskedastic and if there are instances of multicollinearity.

8.1.1 Diagnostic tests

As the data set is quite small, consisting of 351 different observations, it should theoretically be sensitive to outliers. To test this we winsorized our variables at the 1st and 99th percentile. Our regression did not change in a meaningful way to warrant the winsorization, in fact, neither r-squared nor MSE changed. We, therefore, decided not to winsorize our variables, since it did not provide any value to our analysis as well as it would diminish the effect outliers have, which is in a way what this thesis is researching.

Following each regression, excluding those in which we used clustered robust standard errors, we ran tests for heteroskedasticity. We ran both White's test as well as the Breusch-Pagan test to look for heteroskedasticity the results of which can be seen tables A.8, A.9, A.10, A.11, A.12 and A.13 in Appendix A. For our tests using models (1) and (3), the p-value was below 0.01 so we conclude our data is heteroskedastic. Testing model (2) revealed an indifference in White's test and the Breusch-Pagan test. The p-value using the White's test was 0.12 however using the Breusch-Pagan test it was 0.0112. Using the p-value criteria for model (2) as we did for models (1) and (3) of below 0.01 we fail to reject our null hypothesis that the data used in model (2) is homoskedastic.

Another significant diagnostic test is to test for multicollinearity. We did so by applying a VIF-check following each regression of our models using robust standard errors. The results from our VIF-checks can be seen in tables A.14, A.15 and A.16 in Appendix A.

8.2 Main Regression Results

Table 8.1 and 8.2 present our main regression results for our models (1), (2), and (3) using robust standard errors clustered by firm. In Appendix A in tables A.1 and A.2 we present regression results for our models using robust standard errors as well as conventional.

Model (1) has an adjusted r-squared of 0.242 and a constant coefficient of 15 309. It is worth noting that the numbers for model (1) are in thousands. Notable from the model is leverage, for every 1% increase in leverage EBITDA should on average fall by 12 652, statistically significant at the 5% level. Higher cash ratio also negatively affects EBITDA or by 264.1 on average, the standard error is however extremely large or 18 789. Unsurprisingly fish price positively affects EBITDA or on average by 4 886, statistically significant at the 1% level. Our dummy variable for the Icelandic króna, i.e. if the functional currency is the Icelandic króna, negatively affects EBITDA by 7 460, statistically significant at the 10% level. That is, firms who report using the Icelandic króna have, on averge, lower EBITDA by 7.46 million EUR.

Also from table 8.1 we see that model (2) has an adjusted r-squared of 0.084. From the table we see that intangibility reduces EBITDA volatility by 0.35% on average for every 1% of intangibility on books while leverage increases it by 0.04%, on average. The variables having the most effect on EBITDA volatility are fish price and the dummy variable for ISK. With fish price, understandably, having a massive effect, 23.4% change in EBITDA with 1 EUR/kg change in average fish price, statistically significant at the 5% level. Interestingly the dummy variable for ISK increases the change in EBITDA by 2.66%, however it is not statistically significant and it's standard error is 5.14%. Notable result from both models (1) and (2) is the oil price. Previously thought to negatively affect the industries earnings, according to our models it positively affects earnings.

Model (3) has an r-squared of 0.571. For every 1% increase in intangibility, leverage increases by 0.68%. Leverage increases on average by 10.1% for firms whose functional currency is the Icelandic Króna. Notable from model (3) is our year controls, especially the year 2008, in which the coefficient is 0.571, statistically significant at the 1% level.

	A	B
Method	OLS	OLS
VARIABLES	EBITDA conv. EUR	EBITDA volatility
Lag of EBITDA volatility	37.99	
	(26.29)	
Dummy variable for ISK	-7460*	0.0266
	(3637)	(0.0514)
Lag of EBITDA conv. EUR		-1.32e-05***
		(0.00000359)
Intangibility	-10110	-0.345**
	(11819)	(0.142)
Leverage	-12652**	0.041
	(5159)	(0.204)
Cash ratio	-264.1	0.0575
	(18789)	(0.495)
Brent oil	91.21***	0.00235
	(31.12)	(0.00204)
Average Central bank rate %	-20254	0.403
	(33177)	(0.995)
CPI %	44528	0.119
	(45015)	(1236)
Fish price (eur/kg)	4886***	0.234**
	(1048)	(0.0867)
Constant	15309*	-0.246
	(7447)	(0.258)
SE type	Clustered Robust	Clustered Robust
Observations	311	331
Adjusted R-squared	0.242	0.084

Table 8.1: Main regression results for models (1) and (2)

Standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

	C
Method	OLS
Variables	Leverage
Intangibility	0.681***
	(0.160)
Dummy for ISK	0.101
	(0.0763)
2001	Omitted
2002	Omitted
2003	Omitted
2004	0.202***
	(0.0627)
2005	0.138***
	(0.0356)
2006	0.189***
	(0.0356)
2007	0.151***
	(0.0297)
2008	0.571***
	(0.0769)
2009	0.365***
	(0.0973)
2010	0.314***
	(0.0900)
2011	0.223**
	(0.0817)
2012	0.190*
	(0.0913)
2013	0.121
	(0.0765)
2014	0.134*
	(0.0749)
2015	0.0747
	(0.0670)
2016	0.0321
	(0.0620)
2017	0.0581
	(0.0680)
2018	0.0912
	(0.0670)
2019	0.0720
	(0.0657)
2020	0.0678
	(0.0696)
Lag of EBITDA volatility	0.000717
	(0.000861)
Constant	0.123
	(0.0930)
Type	Clustered Robust
Observations	311
R-squared	0.571

Table 8.2: Main regression results for model (3)

Standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

We also tested to see whether our results differ using a fixed-effects model or a random-effects model, controlled for year and firm ID, as can be seen tables A.3 and A.4 found in Appendix A.

To determine whether the fixed-effects or random-effects model is appropriate we used a Hausmann test on each of our three models.The Hausmann test is done to ensure that our results are not endogenous, but instead exogenous.Since the p-value is less than 0.05 only for model (2) we reject the hypothesis that our variables are endogenous and state that they are exogenous and determine a fixed effects model is appropriate. For models (1) and (3) we fail to reject our null hypotheses and state our variables are endogenous and determine that a random effects is appropriate. Hausmann tests are shown in tables A.5, A.6 and A.7 in Appendix A.

Using the random-effects model for model (1), the coefficient for our dummy variable for ISK, is lower than using standard errors clustered by firm or 3.323 million EUR less EBITDA for firms reporting with the Icelandic króna. Model (3)'s intangibility coefficient drops to 0.21% for every 1% increase in intangibility while the dummy's for ISK coefficient increases to 13.2%. That is, on average, firms using the Icelandic króna as their functional currency have 13.2% higher leverage than those who do not use the ISK.

8.3 Robustness

We tested if our results were robust by adding variables for exchange rates to our models. The results from which can be found table A.17 in Appendix A. Notable is small difference in r-squared for model (1) and (3), however for model (2) the r-squared goes from 0.084 to 0.169. In model (2) the coefficient for our dummy variable for ISK also becomes negative. From this test, alongside the diagnostic tests, we assess our models to be robust.

8.4 Hypothesis Testing

In this paper, three hypotheses have been brought forward,

H1: There is a negative relationship between the ISK being the functional currency in annual reports and earnings.

H2: Volatility of EBITDA is less for firms using the Euro or the Dollar as it's functional currency

H3: There is a negative relationship between intangibility and debt.

Although there are some statistical indicators to reject our null hypothesis for H1 we fail to do so at the 5% level using standard errors clustered by firm. We are able to reject the null hypothesis for H1 at the 10% level using standard errors clustered by firm and at the 1% level using robust errors and conventional errors. We however

fail to reject our null hypothesis using a random effects model. To put it clearly, we are able to find some statistical evidence that a firm's earnings are negatively affected if it uses the Icelandic króna as its functional currency using our empirical analysis.

For H2, we cannot reject the null hypothesis and accept H2 at the 5% level. Therefore, we are unable to provide statistical evidence that volatility of EBITDA is less for firms using another functional currency than the Icelandic króna.

For H3, we are able to reject the null hypothesis and accept H3 at the 1% level. Interestingly, Model (3) results contradict common financial theories that firms are less likely to finance themselves using debt as intangibles take a larger share of their assets. That is, as Intangible ITQ has garnered a more significant share of Icelandic fisheries firms, it has not come at the expense of leverage. For H3, we are able to reject the null hypothesis and accept H3 at the 1% level.

9

Discussion

In this section, the results from the hypothesis testing will be discussed, in accordance with the theoretical background followed by limitations to the thesis.

9.1 Discussion

In the previous chapter, we assessed the three hypotheses put forward earlier. From testing our hypotheses using the models outlined in chapter 4 we have only confidently accepted one, H3. There are numerous possible explanations for why we failed to reject the null hypothesis for H1 and H2, few of them will be outlined here.

A possible explanation for being unable to accept H1 could be the Purchasing Power Parity theory essentially indicating that over the roughly two decades our data spans prices, in Icelandic króna, have reached an equilibrium likely due to Iceland's high Exchange rate pass-through. Indicating that the change of functional currency is unnecessary over a long enough time horizon, even though one-off disasters might affect a firm's income and equity in the short term. Given a few caveats like free-floating exchange rates. The same explanations can be given for being unable to accept H2.

Another possible explanation lies in the characteristics of the fishing industry and how its wages are calculated; as noted it is common for fishers' wages to be calculated as a share of the landed value, reducing the firms' dependence on the ISK, as nearly all landed value in Iceland is exported. The calculation of wages also minimizes firms' operating leverage by having less fixed costs acting to manage the industry's risk.

A notable result from the previous chapter was how the accounted ITQ contradicts common financial theories like the trade-off theory, most notably how financial distress cost is assessed. Myers (1984), Berger and Udell (1998), and Michaelas, Chittenden Poutziouris (1999) concluded that the more significant proportion of total assets tangible assets hold, the more levered the firm can get. Myers (1984) connected it to the trade-off theory stating that financial distress cost consists not only of the likelihood of bankruptcy but also the value possibly lost in case of bankruptcy.

This discrepancy between our results and theories can be explained in two ways.

Firstly, due to the nature, scarcity, and permanency of the ITQ, it gives fishers a long-term horizon and provides sufficient collateral for their creditors. Secondly, the decision of IFRS to classify fishing rights, like the ITQ, as intangible assets, which they objectively are.

According to the Modigliani-Miller theorem, the firm value will remain the same regardless of the capital structure. The functional currency as such is not a part of the capital structure, though a part of the financing puzzle in the specific company. We have found no statistical evidence on appropriate significance levels for a decrease in EBITDA using ISK as functional currency or in decreased earnings volatility from substituting currency. Therefore, this argument is applicable for both H1 and H2. This applies that the currency risk seems to be low for Icelandic fisheries. Without currency risk being visible in this context, companies will tend not to take active action against it. The intuitive thought with these facts will be that the portfolio risk, as described in Chapter 2, is low and that the risk of encountering financial distress due to a specific functional currency is low.

Regarding H3 it can be explained with the Pecking Order Theory. Firms historically tend to reduce debt financing with a large amount of intangibles. In our study, that is not the case. According to Pecking Order-Theory debt is preferred before issuing new equity. Though, existing equity is most preferable. The fact that Icelandic fisheries finance themselves with debt even though they have a heavy load of intangibles on their balance sheets could be explained by a lack of equity financing, i.e., they have to use debt as they do not want to issue new equity.

Exchange Rate Pass-Through can be applied for both H1 and H2. Since the results from those models didn't show statistically significant changes depending on currency exchange rates or functional currency, the elasticity price is assumed to be low. ERPT could also be applied backward with export price being focused instead of import price.

Enterprise Risk Management is a theory that we believe needs to be applied more and more in Icelandic companies in general and fisheries, especially as the economy is growing. With growing companies organizations have to grow as well, even though implementation of ERM does not seem to be acute currently, at least not because of the results of low currency risk according to our research. Though, if Iceland should be able to establish the country as a developed market, the need for ERM will likely arise.

The development of the economy will probably also increase the need for price hedging in general and for fisheries commodity price hedging especially. The results of our study can be interpreted as such as concepts like these, and also ERM does not need to be extended yet but that the importance can arise in the future. This assumes that these concepts are not implemented yet, but ERM being a concept with senior characteristics it is unlikely that they are for an emerging nation as Iceland.

9.2 Limitations

There are several limitations to this thesis. The most notable limitation is with data; as mentioned before, the annual reports gathered use different functional currencies and applied different accounting principles throughout the years, making comparability a problematic task. This thesis also did not consider the currency mix of the firms' income, expenses, and liabilities which could have affected our results.

10

Conclusion

10.1 General Conclusions

As a result of our study, currency substitution can be concluded as not being an appropriate mean of managing risk. Theoretically speaking, a larger share of intangibles on a firm's balance sheet should increase its risk as it increases the financial distress costs, therefore reducing leverage. As our results demonstrate, this is not the case with ITQs. There is a statistically significant positive relationship between ITQs on firms' balance sheets and their leverage, indicating that financial distress costs and risk do not increase with a larger share of accounted ITQs.

We had hypotheses that intended to investigate whether functional currency being the Icelandic króna, had a negative impact on EBITDA, and this was also our prejudice before our work. This has been proven to be a false prejudice since we have found no statistical evidence on appropriate significance levels that this is the case. The conclusion is that the earnings are less volatile than what was presumed. We can also conclude that the export price elasticity has been lower than expected. From our results, we are able to say with statistical significance that the Icelandic Króna, over a long enough time horizon, does not negatively affect the earnings of the Icelandic fishing industry, even though 70% of the 20 largest firms in the industry have changed its functional currency from the ISK.

10.2 Contributions and Implications

This thesis has several contributions. Most notably, it contributes to the ever-growing theoretical understanding of ITQs. This thesis also contributes to research on Purchasing Power Parity and its relationship with Exchange rate pass-through.

As we stated in Chapter 1 our purpose was to assess if the currency substitution of the largest fisheries firms in Iceland were an effective tool to manage risk and if the Icelandic króna negatively affects the industries earnings.

In the end, we were unable to find evidence stating that the currency substitution was an effective tool in reducing earnings volatility and if the Icelandic króna negatively affects the industries earnings. Our thesis could be used as help for decision-making about keeping or changing the functional currency a company uses.

The conclusion of this is that our purpose with the thesis has been fulfilled and also partly the aim.

10.3 Further Research

There are several ways that our thesis can be used for further research. For example, a similar study can be made on another country with similar characteristics as Iceland to compare the results. A similar study can also be made on a country with other characteristics, such as a well-developed economy. It could also include several different countries in a study. Another way is to study the characteristics of ITQ and its use as collateral to further the understanding of the mismatch between the relationship between ITQ and leverage and theoretical background. Another fascinating further investigation could be to re-do the same investigation that we have later on in the future. For example, to see if and how the results changed from 2022 to 2032. Also, examine what managerial decisions lie behind the decision to change an entity's functional currency.

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Appendix A

Tables

	Q	W	E	R
Method	OLS	OLS	OLS	OLS
VARIABLES	EBITDA conv. EUR	EBITDA conv. EUR	EBITDA volatility	EBITDA volatility
Lag of EBITDA volatility	37.99	37.99*		
	(33.73)	(21.2)		
Intangibility	-10110**	-10110***	-0.345*	-0.345
	(4198)	(3755)	(0.205)	(0.243)
Leverage	-12652***	-12652***	0.041	0.041
	(3679)	(2673)	(0.191)	(0.184)
Cash ratio	-264.1	-264.1	0.0575	0.0575
	(13815)	(13071)	(0.686)	(0.516)
Brent oil	91.21**	91.21**	0.00235	0.00235
	(41.72)	(43.58)	(0.00202)	(0.0021)
Average Central bank rate %	-20254	-20254	0.403	0.403
	(37311)	(41070)	(1.887)	(1.41)
CPI %	44528	44528	0.119	0.119
	(41354)	(39487)	(2.074)	(1.872)
Fish price (eur/kg)	4886*	4886**	0.234**	0.234**
	(2520)	(2228)	(0.106)	(0.097)
Dummy variable for ISK	-7460***	-7460***	0.0266	0.0266
	(1547)	(1393)	(0.0815)	(0.0766)
Lag of EBITDA conv. EUR			-1.32e-05***	-1.32e-05***
			(0.00000302)	(0.00000282)
Constant	15309*	15309**	-0.246	-0.246
	(7842)	(6884)	(0.335)	(0.321)
Type	Conventional	Robust	Conventional	Robust
Observations	311	311	331	331
Adjusted R-squared	0.242	0.242	0.084	0.084

Standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A.1: Regression of models (1) and (2)

	T	Y
Method	OLS	OLS
Variables	Leverage	Leverage
Intangibility	0.681***	0.681***
	(0.0524)	(0.0596)
Dummy for ISK	0.101***	0.101***
	(0.0245)	(0.0280)
2001	Omitted	Omitted
2002	Omitted	Omitted
2003	Omitted	Omitted
2004	0.202	0.202***
	(0.196)	(0.0631)
2005	0.138	0.138***
	(0.189)	(0.0361)
2006	0.189	0.189***
	(0.188)	(0.0339)
2007	0.151	0.151***
	(0.188)	(0.0305)
2008	0.571***	0.571***
	(0.188)	(0.0716)
2009	0.365*	0.365***
	(0.189)	(0.0727)
2010	0.314*	0.314***
	(0.189)	(0.0619)
2011	0.223	0.223***
	(0.189)	(0.0513)
2012	0.190	0.190***
	(0.189)	(0.0619)
2013	0.121	0.121***
	(0.189)	(0.0457)
2014	0.134	0.134***
	(0.188)	(0.0430)
2015	0.0747	0.0747**
	(0.188)	(0.0372)
2016	0.0321	0.0321
	(0.188)	(0.0347)
2017	0.0581	0.0581
	(0.188)	(0.0381)
2018	0.0912	0.0912**
	(0.189)	(0.0352)
2019	0.0720	0.0720**
	(0.189)	(0.0329)
2020	0.0678	0.0678*
	(0.189)	(0.0361)
Lag of EBITDA volatility	0.000717	0.000717
	(0.000534)	(0.000762)
Constant	0.123	0.123***
	(0.186)	(0.0375)
Type	Conventional	Robust
Observations	311	311
R-squared	0.571	0.571

Standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A.2: Regression of model (3)

	J	K	L	M
Method	OLS	OLS	OLS	OLS
VARIABLES	EBITDA conv. EUR	EBITDA conv. EUR	EBITDA volatility	EBITDA volatility
Lag of EBITDA volatility	24.4	23.55		
	(18.62)	(18.63)		
Intangibility	2653	1472	-0.163	-0.345*
	(3352)	(3301)	(0.299)	(0.205)
Leverage	2420	1554	-0.0105	0.041
	(2684)	(2658)	(0.247)	(0.191)
Cash ratio	11356	11303	0.327	0.0575
	(8111)	(8111)	(0.732)	(0.686)
Brent oil	88.59***	88.84***	0.00425**	0.00235
	(21.92)	(21.97)	(0.00199)	(0.00202)
Average Central bank rate %	-94105***	-90221***	-2.269	0.403
	(21085)	(21064)	(2.023)	(1.887)
CPI %	37516	38082	2.079	0.119
	(23431)	(23407)	(2.2)	(2.074)
Fish price (eur/kg)	7171***	7047***	0.403***	0.234**
	(1357)	(1359)	(0.112)	(0.106)
Dummy variable for ISK	356.6	-3.323	0.0661	0.0266
	(1324)	(1308)	(0.118)	(0.0815)
Lag of EBITDA conv. EUR			-3.66e-05***	-1.32e-05***
			(0.00000511)	(0.00000302)
Constant	-5196	-4018	-0.391	-0.246
	(4502)	(5180)	(0.364)	(0.335)
Type	Fixed effects	Random effects	Fixed effects	Random effects
Observations	311	311	331	331
Adjusted R-squared	0.191		0.16	
Number of firms	20	20	20	20

Standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A.3: Fixed effects and random effects for models (1) and (2)

	N	O
Method	OLS	OLS
Variables	Leverage	Leverage
Intangibility	0.210***	0.285***
	(0.0696)	(0.0659)
Dummy for ISK	0.132***	0.127***
	(0.0300)	(0.0288)
2001	Omitted	Omitted
2002	Omitted	Omitted
2003	-0.112	-0.0937
	(0.137)	(0.138)
2004	0.117*	0.119**
	(0.0601)	(0.0602)
2005	0.0604	0.0614
	(0.0471)	(0.0471)
2006	0.136***	0.133***
	(0.0467)	(0.0465)
2007	0.0861*	0.0845*
	(0.0465)	(0.0463)
2008	0.511***	0.508***
	(0.0451)	(0.0451)
2009	0.324***	0.319***
	(0.0419)	(0.0421)
2010	0.266***	0.262***
	(0.0417)	(0.0419)
2011	0.171***	0.168***
	(0.0410)	(0.0413)
2012	0.133***	0.131***
	(0.0411)	(0.0413)
2013	0.0792*	0.0750*
	(0.0412)	(0.0414)
2014	0.0776*	0.0758*
	(0.0404)	(0.0406)
2015	0.0354	0.0309
	(0.0406)	(0.0408)
2016	-0.00785	-0.0123
	(0.0406)	(0.0408)
2017	0.0114	0.00806
	(0.0404)	(0.0406)
2018	0.0319	0.0305
	(0.0402)	(0.0405)
2019	0.0102	0.00956
	(0.0404)	(0.0406)
2020	-	-
Lag of EBITDA volatility	-0.000137	-3.60e-05
	(0.000391)	(0.000392)
Constant	0.381***	0.354***
	(0.0417)	(0.0521)
Type	Fixed effects	Random effects
Observations	311	311
R-squared	0.626	
Number of firms	20	20

Standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A.4: Fixed effects and random effects for model (3)

	Coefficients			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	Random	Difference	Std. err.
Lag of EBITDA vol.	24.40146	23.54685	0.8546107	1.1187
Intangibility	2652.803	1472.331	1180.472	623.8077
Leverage	2419.799	1554.02	865.7796	417.1849
Cash ratio	11356.03	11302.87	53.16425	565.334
Brent Oil	88.59029	88.84292	-0.2526323	0.3540665
Central Bank rate	-94105.42	-90221.36	-3884.064	1734.823
CPI %	37515.5	38082.06	-566.5619	1935.77
Fish price (eur/kg)	7170.91	7047.133	123.7773	58.89585
Dummy variable for ISK	356.5703	-3.322894	359.8932	228.732

b = Consistent under H0 and Ha; obtained from xtreg.
B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 10.31
Prob > chi2 = 0.2442
(V_b-V_B is not positive definite)

Table A.5: Hausmann test for model (1)

	Coefficients			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	Random	Difference	Std. err.
Lag of EBITDA	-0.0000366	-0.0000132	-0.0000233	4.33E-06
Intangibility	-0.1626864	-0.3452652	0.1825788	0.2303636
Leverage	-0.0105192	0.0410169	-0.0515361	0.1698905
Cash ratio	0.3269213	0.0574703	0.2694511	0.3159541
Brent Oil	0.0042512	0.0023511	0.0019001	0.0003942
Central Bank rate	-2.268603	0.402865	-2.671468	0.8926202
CPI %	2.078857	0.1186909	1.960166	0.9234654
Fish price (eur/kg)	0.4025819	0.2343604	0.1682215	0.0449811
Dummy variable for ISK	0.06606	0.0265825	0.0394776	0.0905059

b = Consistent under H0 and Ha; obtained from xtreg.
B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 31.28
Prob > chi2 = 0.0001
(V_b-V_B is not positive definite)

Table A.6: Hausmann test for model (2)

	Coefficients			
	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	Fixed	Random	Difference	Std. err.
Intangibility	0.2103756	0.2848359	-0.0744603	0.0239048
Dummy variable for ISK	0.1319654	0.1273688	0.0045966	0.0091953
Lag of EBITDA vol.	-0.0001368	-0.000036	-0.0001007	0.0000364
2003	-0.1120054	-0.0937051	-0.0183003	0.0131305
2004	0.1168183	0.1188024	-0.0019841	0.0062831
2005	0.0603856	0.0614064	-0.0010209	0.005812
2006	0.1362141	0.1331617	0.0030525	0.0064559
2007	0.0861301	0.0845446	0.0015855	0.0064647
2008	0.510657	0.5084572	0.0021998	0.0055036
2009	0.3235706	0.3185028	0.0050678	0.0024214
2010	0.2663687	0.2623513	0.0040174	0.001896
2011	0.1711574	0.1682215	0.0029359	0.0015654
2012	0.1328412	0.1308936	0.0019476	0.0013066
2013	0.0792319	0.0749853	0.0042466	0.0018374
2014	0.0776314	0.0758114	0.00182	0.0011197
2015	0.0353896	0.0308941	0.0044955	0.0017616
2016	-0.0078483	-0.012305	0.0044567	0.001769
2017	0.0114212	0.0080595	0.0033617	0.0012079
2018	0.0318711	0.0305019	0.0013691	0.0004449
2019	0.0102103	0.0095571	0.0006532	0.0002695

b = Consistent under H0 and Ha; obtained from xtreg.
B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

chi2(8) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 11.49
Prob > chi2 = 0.1756
(V_b-V_B is not positive definite)

Table A.7: Hausmann test for model (3)

The Hausmann test is done to ensure that your results are not endogenous, instead exogenous. If your result is endogenous that means that the result of one variable is determined by another factor. Since the variables are expected not to correlate with the error term, that will make the OLS- regression failed. Since the p-value is less than 0.05 only for model (2) we reject the hypothesis that our variables are endogenous and state that they are exogenous and determine a fixed effects model is appropriate. For models (1) and (3) we fail to reject our null hypotheses and state our variables are endogenous and determine a random effects is appropriate.
White's test are made to look for heteroskedasticity. So is the Breusch-Pagan test. In the best of worlds, your regression would be homoskedastic. Since the p-value is less than 0.05 for models (1) and (3) we reject the null hypothesis that our regression is homoskedastic and note that our data are heteroskedastic. For model (2) the p-value is less than 0.05 using White's test but not when using the Breusch-Pagan test.

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

chi2(53) = 80.40
Prob > chi2 = 0.0090

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	80.4	53	0.009
Skewness	12.94	9	0.1656
Kurtosis	3.97	1	0.0464
Total	97.3	63	0.0036

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of EBITDA

H0: Constant variance

chi2(1) = 69.09
Prob > chi2 = 0.0000

Table A.8: White's test and Breusch-Pagan's test for heteroskedasticity for model (1) using conventional OLS regression

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

chi2(53) = 80.40
Prob > chi2 = 0.0090

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	80.4	53	0.009
Skewness	12.94	9	0.1656
Kurtosis	3.97	1	0.0464
Total	97.3	63	0.0036

Table A.9: White's test for heteroskedasticity for model (1) using robust standard errors

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

chi2(53) = 65.25
Prob > chi2 = 0.1206

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	65.25	53	0.1206
Skewness	12.48	9	0.1874
Kurtosis	2.62	1	0.1057
Total	80.35	63	0.0693

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of Change in EBITDA

H0: Constant variance

chi2(1) = 65.47
Prob > chi2 = 0.0112

Table A.10: White's test and Breusch-Pagan's test for heteroskedasticity for model (2) using conventional OLS regression

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

chi2(53) = 65.25
Prob > chi2 = 0.1206

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	65.25	53	0.1206
Skewness	12.48	9	0.1874
Kurtosis	2.62	1	0.1057
Total	80.35	63	0.0693

Table A.11: White's test for heteroskedasticity for model (2) using robust standard errors

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

chi2(69) = 124.61
Prob > chi2 = 0.0000

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	124.61	69	0
Skewness	38.28	20	0.0082
Kurtosis	8.04	1	0.0046
Total	170.92	90	0

Breusch–Pagan/Cook–Weisberg test for heteroskedasticity
Assumption: Normal error terms
Variable: Fitted values of Leverage

H0: Constant variance

chi2(1) = 36.45
Prob > chi2 = 0.0000

Table A.12: White's test and Breusch-Pagan's test for heteroskedasticity for model (3) using conventional OLS regression

White's test
H0: Homoskedasticity
Ha: Unrestricted heteroskedasticity

chi2(69) = 124.61
Prob > chi2 = 0.0000

Cameron & Trivedi's decomposition of IM-test

Source	chi2	df	p
Heteroskedasticity	124.61	69	0
Skewness	38.28	20	0.0082
Kurtosis	8.04	1	0.0046
Total	170.92	90	0

Table A.13: White's test for heteroskedasticity for model (3) using robust standard errors

Variable	VIF	1/VIF
Average Central bank rate %	4.56	0.21927
CPI %	4.05	0.246888
Brent oil	3.81	0.262736
Leverage	2.32	0.430965
Fish price (eur/kg)	2.24	0.44617
Intangibility	1.61	0.622497
Dummy variable for ISK	1.35	0.738865
Cash ratio	1.23	0.8151
Lag of EBITDA vol.	1.03	0.97504
Mean VIF	2.47	

Table A.14: VIF-check for model (1)

Variable	VIF	1/VIF
Average Central bank rate %	4.47	0.2237
CPI %	3.7	0.270574
Brent oil	3.66	0.273053
Leverage	2.33	0.429202
Fish price (eur/kg)	1.85	0.540384
Intangibility	1.56	0.639381
Dummy variable for ISK	1.51	0.66357
Lag of EBITDA conv. EUR	1.36	0.735226
Cash ratio	1.2	0.834242
Mean VIF	2.4	

Table A.15: VIF-check for model (2)

Variable	VIF	1/VIF
2019	19.82	0.050452
2020	19.82	0.050462
2018	19.82	0.050464
2017	19.79	0.050525
2016	19.77	0.050574
2015	19.77	0.050578
2014	19.77	0.05058
2013	18.89	0.052942
2012	18.89	0.052943
2011	18.89	0.052948
2010	18.01	0.055511
2009	18	0.055569
2006	17.91	0.055832
2008	17.91	0.055845
2007	17.9	0.055855
2005	16.13	0.061989
2004	7.83	0.127787
Dummy variable for ISK	1.39	0.720319
Lag of EBITDA vol.	1.05	0.952119
Intangibility	1.02	0.978663
Mean VIF	15.62	

Table A.16: VIF-check for model (3)

	z	x	v
Method	OLS	OLS	OLS
VARIABLES	EBITDA conv. EUR	EBITDA volatility	Leverage
Intangibility	-9075	-0.288**	0.681***
	-11818	(0.132)	(0.160)
Dummy for ISK	-7721*	-0.0547	0.101
	-3895	(0.0462)	(0.0763)
2001			-
2002			-
2003			-0.0320
			(0.0368)
2004			0.108*
			(0.0545)
2005			0.0601
			(0.0389)
2006			0.0868***
			(0.0222)
2007			-
2008			0.286***
			(0.0419)
2009			-
2010			0.0276**
			(0.0123)
2011			-0.111***
			(0.0359)
2012			-0.0640**
			(0.0292)
2013			-0.168***
			(0.0377)
2014			-0.141***
			(0.0457)
2015			-
2016			-0.0223
			(0.0182)
2017			-
2018			-0.0152
			(0.0187)
2019			0.00585
			(0.0241)
2020			-0.0379
			(0.0300)
Lag of EBITDA volatility	40.89		0.000717
	(25.40)		(0.000861)
EUR/ISK	26.08	0.0584**	0.00838***
	(440.1)	(0.0212)	(0.00203)
USD/EUR	-2380	11.79**	Omitted
	-72593	(4.228)	
USD/ISK	-446.2	-0.122***	-0.00868***
	(613.7)	(0.0346)	(0.00230)
GBP/ISK	241.1***	0.0233***	0.000288
	(64.68)	(0.00504)	(0.000809)
Leverage	-14082**	0.0986	
	-5706	(0.168)	
Cash ratio	-1381	0.448	
	-19053	(0.528)	
Brent oil	15.47	0.00142	
	(28.24)	(0.00234)	
Average Central bank rate %	-99344**	-13.28***	
	-39726	(3.195)	
CPI %	162671***	16.33***	
	-54219	(3.659)	
Fish price (eur/kg)	13392***	1.318***	
	-3361	(0.238)	
Lag of EBITDA conv. EUR		-1.23e-05***	
		(3.16e-06)	
Constant	6962	-10.64***	0.0595
	-65989	(3.635)	(0.156)
Observations	311	331	311
R-squared	0.262	0.169	0.571

Table A.17: Robustness test: Added exchange rates

Correlation Matrix

Variable:	EBITDA conv. EUR	Leverage	Intangibility	Cash ratio	Fish price (eur/kg)	Brent Oil	Central Bank rate	CPI %	EUR/ISK	USD/ISK	GBP/ISK	USD/EUR	Vol. EBITDA conv. EUR	ISK	EUR	USD	EBITDA(isk)	EBITDA(eur)	EBITDA(usd)
EBITDA conv. EUR	**1.0000**																		
Leverage	-0.3527*	**1.0000**																	
Intangibility	-0.2489*	0.4962*	**1.0000**																
Cash ratio	0.1452*	-0.3095*	-0.2967*	**1.0000**															
Fish price (eur/kg)	0.2053*	-0.3354*	0.0574	0.0635	**1.0000**														
Brent Oil	-0.0322	0.4041*	0.0461	-0.0466	-0.5382*	**1.0000**													
Central Bank rate	-0.1060	0.4304*	0.0343	-0.0944	-0.5156*	0.7995*	**1.0000**												
CPI %	-0.0520	0.4848*	0.0164	-0.0059	-0.5759*	0.7447*	0.7882*	**1.0000**											
EUR/ISK	0.1802*	0.0212	0.0992	0.1837*	0.3242*	-0.0531	-0.3466*	0.0916	**1.0000**										
USD/ISK	0.1871*	-0.1450*	0.0758	0.1704*	0.5745*	-0.3548*	-0.5737*	-0.1935*	0.9118*	**1.0000**									
GBP/ISK	0.1702*	0.0438	0.0972	0.1626*	0.2277*	0.0555	-0.2740*	0.0767	0.9386*	0.8531*	**1.0000**								
USD/EUR	-0.0268	-0.3651*	-0.0759	-0.0455	0.4354*	-0.7024*	-0.4992*	-0.6879*	-0.2704*	0.1370	-0.2555*	**1.0000**							
Vol. EBITDA conv. EUR	0.0832	0.0726	-0.0230	-0.0042	0.0098	0.0685	0.0792	0.0417	-0.1367	-0.1324	-0.1079	0.0008	**1.0000**						
ISK	-0.3539*	0.2747*	-0.0193	-0.0869	-0.4075*	0.2709*	0.3766*	0.1908*	-0.4829*	-0.5377*	-0.4032*	-0.0745	0.1112	**1.0000**					
EUR	0.2018*	-0.1101	0.2342*	-0.0879	0.3084*	-0.2045*	-0.2724*	-0.1301	0.3517*	0.3952*	0.2872*	0.0602	-0.1003	-0.7452*	**1.0000**				
USD	0.2446*	-0.2519*	-0.2842*	0.2434*	0.1803*	-0.1206	-0.1835*	-0.1001	0.2320*	0.2535*	0.2022*	0.0278	-0.0262	-0.4578*	-0.2517*	**1.0000**			
EBITDA(isk)	0.9098*	-0.2139*	-0.1548	0.1238	0.2455*	0.0505	-0.0299	0.0677	0.2967*	0.2557*	0.2851*	-0.1578	0.1769	.	.	.	**1.0000**		
EBITDA(eur)	0.2507*	-0.1255	0.2053*	-0.0779	0.3078*	-0.2016*	-0.2719*	-0.1285	0.3534*	0.3962*	0.2918*	0.0582	-0.0953	-0.7423*	0.9961*	-0.2507*	.	**1.0000**	
EBITDA(usd)	0.4427*	-0.2247*	-0.1818*	0.2160*	0.1316	-0.0796	-0.1582*	-0.0747	0.2052*	0.2123*	0.1866*	-0.0006	-0.0242	-0.3751*	-0.2062*	0.8193*	.	-0.2054*	**1.0000**

(*) indicated statistically significant correlation at 1% level

Table A.18: Amended Pearson's correlation matrix, including EBITDA reported in ISK, EUR and USD