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Overheating, Bubbles and Stagflation in the Norwegian Economy

An empirical study of crisis anatomy.

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Abstract

Since the turn of the millennium, a lasting period of mostly strong national economic growth has persisted. In the autumn of 2021, the Norwegian Central Bank began increasing the policy rate and has since increased it 13 times. This rapid increase in policy rate came about due to increasing inflation and a weakened currency. This thesis aims to assess if the economy is headed towards a crisis by conducting an empirical analysis of the present-day economy and a comparative analysis of past crises. The primary conclusion drawn is that the Norwegian economy shows strong signs of having been slowly overheated and is now perhaps headed towards stagflation,

The empirical analysis involved estimating the Taylor rule and Tobin's Q as well as using the Hodrick-Prescott filter to estimate the long-term trend in various macro indicators. The Taylor Rule was used to assess the central bank's recent historical interest rate decisions, while Tobin's Q was used to check for deviation from fundamental values in the stock market.

The results from Taylor Rule and Tobin's Q indicate that the Norwegian economy has had the necessary foundations to become overheated through an artificially low policy rate and actual overheating in the stock market. Combined with the strong growth in macro indicators such as GDP, consumption, and household leverage, it seems quite clear that there has been at least some overheating.

With unemployment creeping upwards, inflation rising swiftly, and GDP slightly plateauing, it is tempting to speculate on the potential of incoming stagflation. Many fundamental factors are also in place compared to historical incidents, such as increased prices for global input factors and a long period of previous overheating.

Keywords – *Asset Bubbles, Crisis Anatomy, Overheating, Policy Rates, Stagflation*

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This master's thesis was written as part of the Master of Science in Economics and Business Administration at the Norwegian School of Economics. This thesis aims to examine the state of the Norwegian economy in the context of empirical analysis and historical comparison.

The process of writing this thesis has been immensely rewarding. As students of financial economics, being able to explore the academic field in the intersection between finance and economics has broadened our minds and significantly increased the outcome of our master's degree. Creating a deep understanding of the foundational facets of our economy and society has always been an important motivation for studying at the Norwegian School of Economics, which we now can fully appreciate.

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Lastly, we express gratitude for our joint decision to join the school's student orchestra, where we met, a brilliant move that laid the foundation for a prosperous and fun student life.

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1. Introduction

1.1 Background

Since the 1970s, the world, including Norway, has seen unprecedented growth far above the growth rates we have experienced historically. Key factors such as household debt ratios, housing prices and the stock market have increased exponentially. Globally, billions of people have risen out of poverty. Through collaboration and trade, more and more nations have been able to participate in the prosperity of the 20th and 21st centuries.

The world is changing, and what seemed obvious before now hangs in the balance. Covid-19, war, and global polarisation have set the foundations for the situation we see in the Norwegian economy today. Inflation is skyrocketing, the currency has lost much of its value, and more and more people are having problems paying off their mortgages. What seemed to be everlasting stable economic conditions are now seemingly thrown into an imbalance.

Seeing new developments internationally and how incidents ranging from the COVID outbreak in China, and US trade bans to Russia's iron grip over the European energy supply can lead to massive changes and shocks to the economy, we have found it interesting to look further into the matter of the Norwegian economy, and how likely it is that we are heading for a crisis.

1.2 Research questions

Policy rates and inflation are on the rise once again. Simultaneously, we observe a more tense world order potentially threatening global logistics, stability, and trade (Cha, 2022). This has a considerable effect on a small open economy like Norway. Internal financial stability and robustness to external factors are vital for Norway to handle macro-political external shocks. With this in mind, we have found it interesting to examine the following research question.

Is the Norwegian economy heading into a crisis?

We have focused on the following two sub-questions to help answer the primary problem.

- i. *What indicators are there for the different stages of a crisis?*
- ii. *How does the present-day situation compare to historical crises?*

In terms of indicators for the different stages of a crisis, we have chosen to analyse developments and trends in the Norwegian economy in both short- and long-term perspectives, based on the Grytten and Hunnes seven-step crisis model, with inputs from Minsky and Kindleberger. We will also conduct a comparative analysis between the present-day economy, and those of recent economic crises.

1.3 Structure

We have structured this thesis into eight chapters, starting with an introduction in chapter one. In chapter two, we introduce the theory and framework applicable to the discussion. Furthermore, in chapter three, we introduce the two main methodologies used in the analysis. In chapter four, we explain the backdrop of the present-day economy, with the most recent developments, before we introduce our data in chapter six. Chapter seven is our analysis, where we apply the methodologies introduced in chapter three, as well as the Hodrick-Prescott filter, to examine macro indicators. We will discuss our findings in chapter seven using the framework from chapter two, before concluding our thesis in chapter eight.

1.4 Recent work in the field

The possibility of impending economic cracks and crises preoccupies many, and economists in private and public companies try to foresee what will happen in the future and explain what has happened before. Important theoretical frameworks for such predicaments are the Minsky model, the Kindelberger theory and the Grytten & Hunnes seven-step dynamic crisis model.

An important quarterly report is the *Monetary Policy Report (PPR)* by the Norwegian Central Bank. The report strives to explain the economic situation we are in today and give an indication of what direction they believe the economy is headed. In their most recent report, *PPR4/23*, the central bank emphasises the large uncertainty the economy faces regarding growth, inflation, and unemployment. Despite the uncertainty, the Central Bank carefully predicts a decrease in inflation in the following years, towards the targeted inflation rate of two percent beyond 2025 (Norges Bank, 2023).

Statistics Norway, or SSB, also regularly publishes reports. They comment on international cycles and developments through their quarterly report *Økonomiske analyser*, or economic analyses. In their most recent report, the *Economic Analysis 4/2023*, they predict continued weak cycles in the coming years due to continued high interest rates, inflation, and international instabilities such as the war in Ukraine (SSB, 2023a)

Beyond public institutions, most economists in the largest banks and private institutions seek to predict the economic outlook, and comment on developments regularly. Overheating, asset bubbles and rent policy are highly popular research questions for an educational thesis as well. In addition, academia closely follows the tendencies in the economy and is eager to comment on both public policy and academic predictions.

1.5 Limitations

As a small, open economy, Norway is highly affected by the policies and developments of nations outside its control or influence (Orvedal & Norman, 2010). We have still chosen to focus primarily on conditions in the Norwegian economy and will only briefly touch upon external influences through our discussion.

Our research question is extensive and can be answered from numerous perspectives. We have had the ambition to answer the questions at the intersection between financial and economic theory. We will avoid getting too deep into global and international developments and only touch briefly on these indirectly - our primary focus is on the developments of the Norwegian economy.

Despite having narrowed the thesis down to the Norwegian economy and only using three different methodological tests, we still believe it is wide enough to give some real insight into the state of the economy.

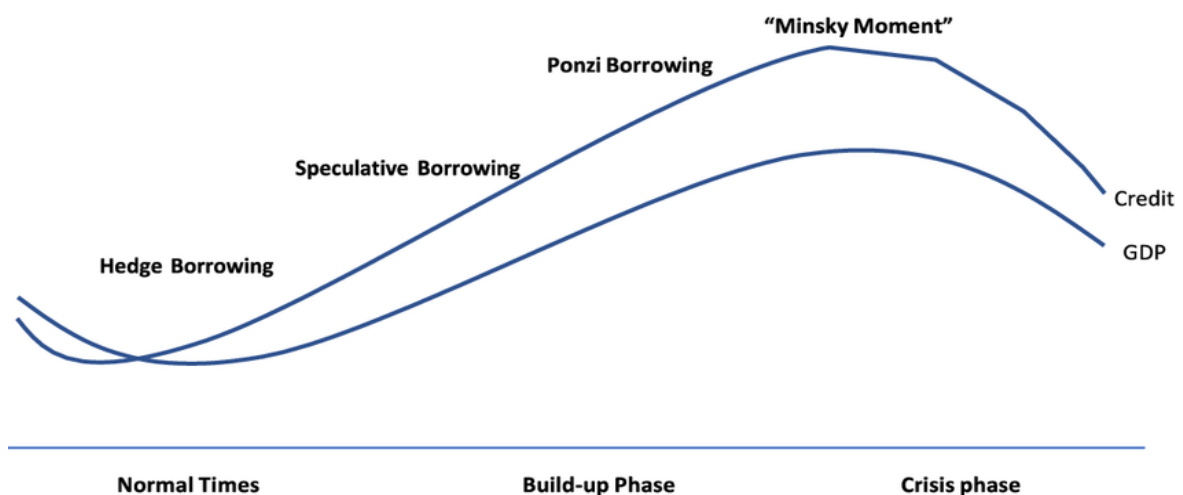
2. Theory

This thesis uses the Grytten and Hunnes seven-step dynamic crisis model as the foundation for our discussion on the state of the Norwegian economy. To understand the seven-step dynamic crisis model, it is necessary to explain the theoretical foundation on which it builds, which gives deeper insight when conducting our analysis and discussions at a later stage. In addition, we will use inputs from Hyman Minsky and Charles P. Kindleberger.

2.1 Hyman Minsky

Hyman Minsky formulated the *financial instability hypothesis* in the 1960s and 1970s, significantly impacting how we interpret and handle financial crises today (Grytten & Hunnes, 2016). The Minsky crisis model emphasises the importance of loss of financial stability as the cause of any financial crisis. He separates market financing types between hedge-, speculative- and Ponzi finance, with economically unstable systems having more of the latter two (Minsky, 1992). He identified five phases to the crisis anatomy, starting with displacement and ending with discredit. The Minsky model is endogenous, which means it identifies internal events and instabilities within the systems as causes of financial instability and crisis.

Figure 1: Financial Instability Hypothesis (Ybrayev et al., 2023)



2.1.1 Financial three-step taxonomy

Minsky identified three types of finance: hedge-, speculative and Ponzi finance. He defined Hedge finance as the healthiest form of finance, where valuations are based on actual returns and what companies can produce (Kindleberger & Aliber, 2005). Speculative finance means that investors speculate in fundamental shifts that will push prices upward in the future. Ponzi finance is the most unstable form of finance, which means price increases are pushed by increased availability of credit and money supply, and not because fundamental values have shifted, or investors believe the market foundations have changed enough to speculate on future earnings growth. The more of the latter two types of financing a system has, the more unstable it is, and the further above the long-term growth trend in the economy the business cycle is likely to become (Minsky, 1992).

2.1.2 From displacement to uncertainty

Hyman Minsky's crisis model is endogenous, and consists of five different stages, which explain the cause up to, and after the *Minsky Moment* (Grytten & Hunnes, 2016). The first phase is launched by a *displacement* in the economy. The displacement is often caused by a change in policy or expectations that leads to financial instability, leading to too much available credit and increased money supply. Minsky emphasises the internal instabilities of the financial systems as the main cause of such displacements. From the *displacement*, the economy will move further towards more speculative finance, and *overtrading* will ensue. During overtrading, prices will increase as a speculative mania takes root. *Monetary expansion* follows and prices keep climbing due to the increased access to credit, not due to an increase in intrinsic value or expectations, previously explained as Ponzi-finance.

Minsky moment

At some point, investors will realise they have overvalued their assets or that the influx of new investors and new capital is drying up (Grytten & Hunnes, 2016). Such realisations will gradually lead to investors losing faith in the market's growth. The moment the masses change their expectations from optimism to pessimism is known as the *Minsky moment*, when the market shifts- and a downturn ensues. The *economic revulsion* might be drastic and sudden or more drawn out. The revulsion and fall in prices can then lead to *discrediting* and harmful path

dependency, where the economy keeps declining, also below the long-term trend, and investors hold out on reinvesting due to a belief that the markets might drop even lower, beyond the levels they, themselves, believe to be reasonable.

2.1.3 Leverage cycles

An implication of the three-step taxonomy and its connection to the crisis model is the importance of leverage cycles (Grytten & Hunnes, 2016). According to Minsky, gearing increases in good times because firms aim to capture market shares from their competitors, fuelled by increased leverage and debt and overly optimistic views of the future state of the economy and business. In addition, in times of crisis, when the economy turns and discredit ensues, gearing increases as banks become procyclical and are more hesitant to supply debt, meaning companies tear on their equity reserves. Looking at leverage and its development over time might give insight into whether the economy is stable at trend or heading towards overheating.

2.1.4 Current relevance and criticism

Minsky believed all economies go through the cycle from displacement to discredit and had, in a sense, a pessimistic view of the economy. Minsky's insights are essential in and of themselves, but also because they lay the foundations upon which Kindleberger and Grytten & Hunnes later built their theories and models.

Kindleberger criticised Minsky's model, saying that it did not explain the anatomy of modern financial crisis very well, with more extensive international cooperation, rapid communication, and everyday banking. Kindleberger also argued that crisis unfolds differently depending on what actions hegemony powers take and said that a set model where the crisis went from one step to the next chronologically was not the case for many of the financial crises we have seen in the last century. Kindleberger, therefore, with inspiration from Minsky's model, formulated his theory.

2.2 Kindleberger Crisis Theory

2.2.1 Charles P. Kindleberger

Charles P. Kindleberger (1910-2003) formulated a theory based on the Minsky model and historical events (Grytten & Hunnes, 2016). Crises in the interwar period were significant. Contrary to Minsky's model, Kindleberger's model is exogenous, meaning the crisis is believed to be triggered by an external shock rather than internal financial instability. Kindleberger is also a neoclassical economist, meaning he looks especially at the changes on the supply side as reasons why crises begin, even though he does not in any way exclude that there might be demand-side shocks as well. The most crucial difference might be his less deterministic view of crisis anatomy and how a solid, rational, and strong hegemony power might break the cycle of overheating and discrediting by applying countercyclical policies. Kindleberger's model has six less distinct phases, starting with an exogenous shock.

2.2.2 Kindleberger's Crisis Anatomy

In contrast to Minsky, Kindleberger believes that an external shock to the economy is the natural first step towards a crisis (Grytten & Hunnes, 2016). This could be any outside event that significantly alters economic expectations. Examples of such events include significant findings of natural resources, signals that interest rates are changing significantly, war, and logistical challenges or great technological leaps. The external shock has many similarities to Minsky's displacement phase.

The next phase is *monetary expansion*, which includes an expansion in credit and money supply (Grytten & Hunnes, 2016). With an increased supply of credit, more speculation ensues in the phase called *swindlers*. Using Minsky's terminology, this phase shifts the economy towards more speculative and Ponzi finance, kicking off overheating in the economy.

Sooner or later, investors will become aware of the overheated economy, and it will enter a critical phase (Grytten & Hunnes, 2016). Investors and the government might become frightened, and the government might want to demonstrate their decisiveness. If hegemony powers are not able to take the proper measures, domestic propagation between markets and

industries, followed by international propagation, might ensue. Leading first the national economy and, ultimately, the world economy into a decline.

2.2.3 Hegemonial power

As mentioned, Kindleberger differs from Minsky in his less deterministic views. According to Kindleberger, a strong and well-functioning hegemony power, such as central or large banks, the government, or powerful international institutions, can contribute to avoiding crises before they start, or lessen the length and depth of a crisis if it has already begun (Grytten & Hunnes, 2016). The government can, for example, spend less money in good times and more in bad times to encourage more investments and activity when the economy is slow. The central bank should optimally try to cool down or heat the economy by deciding the rent counter-cyclically. In times of financial crisis, central banks might even function as a lender of last resort. This means low rents during discredit and instead keep the rent higher in good times to counter monetary overexpansion.

Lack of hegemony power might have the opposite effect (Grytten & Hunnes, 2016). With no solid organisation for countercyclical actions, the private markets tend to accelerate in whatever direction they are headed until crisis or overheating ensues. Without strong and well-functioning hegemony powers, crises might become more frequent, longer lasting and deeper.

2.2.4 Relevance and Criticism of Kindleberger's Theory

Kindleberger is relevant as he gives insight into alternative reasons for displacement in the economy and introduces the importance of a hegemony power and the possibility for such powers to lessen the crisis. However, he has received criticism for his model's empirical background and simplicity.

Hans O. Melberg (1998) criticised Kindleberger for giving too much credit to the hegemony powers and their abilities to stop or lessen crises. Meberg argued that Kindleberger was right that hegemony powers played an important role but that he went too short in explaining the exact mechanics and, in part, relied too much on historical events during the interwar period.

Melberg continues his criticism, saying that Kindleberger has failed to search for alternative explanations for previous crises and has not looked upon sufficient empirical data to conclude

as he does (Melberg, 1998). Melberg argues that other economic factors might have a significant impact that should be explored before concluding, as Kindleberger has done. An example is how Melberg points out the importance of business cycles as a natural part of the economy, which Kindleberger focuses very little on. According to Melberg, Kindleberger built his model primarily upon the periods of crisis, which supports his theory and disacknowledges the periods of financial stability and claims that, in some ways, contradict his theory. If Kindleberger's model is well suited to explain the anatomy of the financial crisis in the economy despite its limitations, Melberg argues that we should have seen a lot more financial crises than we have.

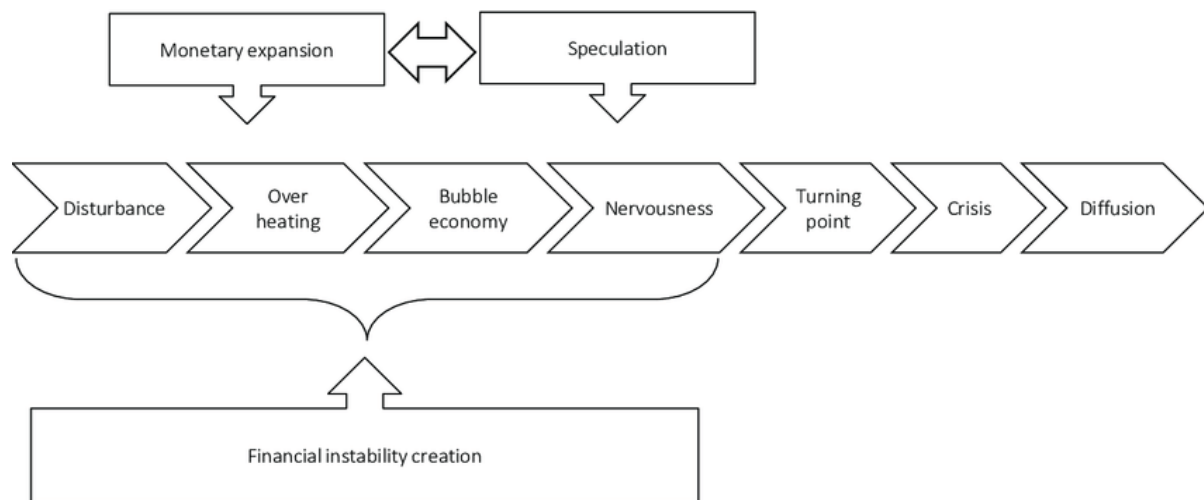
From the foundations created by Minsky and Kindleberger, Grytten and Hunnes (2016) have created a more dynamic and adaptable model, which emphasises historical empirical data to a more significant degree and opens for both exogeneous and endogeneous and supply- and demand side shocks as triggers to rapid changes in the economy. Therefore, the seven-step dynamic crisis model is the natural framework when approaching economic analyses and when answering our problem thesis.

2.3 Seven-step dynamic crisis model

2.3.1 Grytten & Hunnes Seven-step dynamic model

Grytten and Hunnes developed a dynamic model based on the works of Minsky, Eichengreen, and, more importantly, Kindleberger, relying heavily on empirical findings. Their model consists of seven dynamic steps, meaning not all crises have all seven, and the economy might go through all or go back and forth between a few of the steps. The model is created to explain the course of crises without saying all crises follow a set pattern or look the same (Grytten & Hunnes, 2016). Figure 2 shows a representation of the seven-step dynamic crisis model:

Figure 2: Seven-Step Dynamic Crisis Model (Grytten & Koilo, 2019)



2.3.2 Phase 1: Disturbance

The disturbance to the economy might be both exogenous and endogenous and can affect supply and demand. This means any internal instabilities mentioned by Minsky and any external happening mentioned by Kindleberger are causes that might lead to such a disturbance. The disturbance often kicks off the creation of financial instability and monetary expansion and considerably improves growth expectations. The markets and their investors change their expectations to the overly optimistic, and overheating of the economy often ensues. It is often characterised by increased demand and an economic resurgence (Grytten & Hunnes, 2016).

2.3.3 Phase 2: Overheating

Naturally, following a disturbance in the economy, with higher and more positive expectations, is overheating (Grytten & Hunnes, 2016). A notion of “this time is different” takes hold, and economic players assume the new growth rates are permanent. Due to the changes in expectations, more credit will be demanded to make increasingly more speculative investments. As financial speculations become attractive, monetary expansion follows. Increased investments, credit and money lead to rising asset prices, and hence, economic growth.

2.3.4 Phase 3: Bubble Economy

When higher growth in investments continues, investors might believe the price increase will continue for some time and not risk potentially being left out of profits (Grytten & Hunnes, 2016). The increase in credit and speculative economic growth does not have accurate economic coverage, and there might be a slowdown in economic growth. It is even harder to dial back on speculative investments because there are often fundamental economic factors that might explain why the economy is experiencing renewed growth, leading to biased valuations.

2.3.5 Phase 4: Nervousness

At some point, the realisation that assets are overpriced, and a corresponding correction is imminent might show in the economic growth (Grytten & Hunnes, 2016). In this situation, lenders will become more risk-averse, and investors will become less speculative. The markets react strongly to positive and negative information, as investors are nervous, and the markets are unstable. With banks becoming more risk averse, credit becomes less available. Governments might realize that there is a potential for a crack and might try to stimulate the economy to postpone the crisis or skip it altogether. The government continues to stimulate economies in periods of nervousness after bubbles have formed, which can then contribute to forming even bigger bubbles and is not necessarily healthy for the economy in the long term.

2.3.6 Phase 5: Turning Point (Minsky Moment)

The turning point in the economy occurs when most investors lose belief in continued growth and start selling their assets to limit losses (Grytten & Hunnes, 2016). In such a situation, there might be a run on the bank, and supply will far outgrow demand, which drives prices down. There are three leading causes of the sudden lack of economic investments. Firstly, access to new credit might become limited, as banks often work procyclical and become more hesitant to lend money in declining markets. Secondly, investors who have adjusted their expectations will not invest before they believe profits will be made. Lastly, investors will wait to invest until they believe prices have reached rock bottom.

2.3.7 Phase 6: Crisis

The economy sharply declines, and bankruptcies increase as overly pessimistic expectations take hold (Grytten & Hunnes, 2016). A harmful path dependency might form, where bankruptcies lead to banks taking losses, making them even more risk averse in issuing new debt, meaning companies who could have otherwise survived, go bankrupt. Firms' revenue streams might decline, leading them to lay off employees, which lessens consumer purchasing power, and again leading to a decline in revenue streams, a negative cycle challenging to break. A form of negative speculation might come from investors with the capital necessary to help halt the crisis, choosing to get the lowest possible prices when investing. Often, banks collapse, and there forms negative bubble tendencies.

2.3.8 Phase 7: Diffusion

A crisis is rarely contained within one sector or market and often spreads to other parts of the economy (Grytten & Hunnes, 2016). As banks take on losses, they might become more risk-averse, leading to less availability of credit in other markets as well. If employees in a significant sector lose their jobs, there might be a drop in purchasing power in the economy. In that case, the chance of the crisis going from a financial to an economic crisis increases, with higher unemployment and more profound cyclical deviations.

2.4 Asset Bubbles

Minsky, Kindleberger, and Grytten & Hunnes point at bubbles in various markets as factors that can lead to nervousness, cracks, and economic crises. It is, therefore, essential to understand what asset bubbles are and what qualitative and quantitative signs to look out for to determine whether a market or the economy might be in a bubble state. It is impossible to state with complete certainty that there really has been a bubble before after it has cracked, and even though all signs of a bubble are present, the economy is not necessarily nearing a crack (Grytten & Hunnes, 2016).

2.4.1 Asset bubbles

When the prices of assets rise far beyond fundamental values, there are asset bubbles (Grytten & Hunnes, 2016). However, it is often difficult to calculate the fundamental values of assets. Therefore, identifying bubbles often comes down to estimating the fundamental values and the gap between them and market prices. The two main ways of identifying bubbles are to investigate deviation from long-term trends and investigate fundamental values and current prices. There are multiple ways of estimating fundamental values: price over earnings, economic models for fundamental values and a traditional bubble test.

Crises affecting the entire economy often start with specific industries and markets before they spread to the bigger parts of the economy and eventually gain international momentum (Grytten & Hunnes, 2016). According to Reinhart and Rogoff, housing price bubbles were the leading indicator of a potential incoming banking crisis (Reinhart & Rogoff, 2009). Moreover, with the banking crises, the lack of credit could spread to more industries, and crises might ensue.

2.4.2 Euphoric- and non-euphoric bubbles

Asset bubbles can be either euphoric or non-euphoric, depending on the basis on which the bubble has formed (Grytten & Hunnes, 2016). Euphoric bubbles are speculative bubbles. They are characterised by rapid price growth that fundamental economic factors, such as increased earnings or supply shortages, cannot explain. Non-euphoric bubbles can be explained based on fundamental factors, such as how population growth can lead to higher real estate prices. Determining whether a bubble is euphoric or non-euphoric is difficult, as there are often good indicators of why prices are as they are.

2.4.3 Shift away from long-term trends

As mentioned, a popular method to test for economic bubbles is to compare current prices to long-term trends. Various different methods can be used to estimate a growth trend of a time series, and then look for significant deviations from the found trend in order to estimate bubbles.

A weakness of checking for bubbles through the shift in the long-term trend is that it often does not account for shifts in fundamental value. For example, rental prices might go up, leading to higher fundamental values for houses, meaning the new and higher prices make sense. Another

example is that there might also be higher population growth than new homes being built. These, and many other factors, mean that a single long-term growth trend analysis is seldom sufficient to tell whether the housing market or the economy is nearing a crack. Looking deeper into fundamental values and drivers for growth is also necessary when considering the research question. An example of a computational tool for long-term trend analysis is the Hodrick-Prescott filter, which we will explain further in the analysis.

2.4.4 Shift away from fundamental values

The second method mentioned is to check if the prices have shifted away from fundamental values. Claiming that an asset is overpriced is risky if it is traded on the free market, and there must be significant proof for such a statement if it is to be taken seriously. A Thorough investigation into the fundamental values of assets is, therefore, an excellent addition to estimating the long-term trend.

To investigate shifts away from fundamental values, factors such as Tobin's Q or price-to-earnings ratios are possibilities; other than that, looking for qualitative indicators in the economy might help spot potential bubbles (Grytten & Hunnes, 2016).

2.4.5 Indicators for Bubbles

Having clarified the importance of identifying bubbles in the economy and quantitative ways of identifying them, it is now essential to know what indicators to look for. Grytten & Hunnes (2016, p80) gave twenty examples of factors that might indicate potential bubbles; these were:

Table 1: *Indicators For Bubbles (Grytten & Hunnes, 2016, p80)*

Rapidly increasing prices	Expectations of continuous price increases
High expected values compared to the historical average.	High expected values compared to reasonable prices.
Several years of economic growth	Reasonable reasons for increased prices
An explanatory element to new prices (e.g. Increased Immigration for housing prices)	Subjective “paradigm shifts.”
The influx of new investors and capital	New entrepreneurs within a sector
A lot of media coverage and interest in a sector	More debt
Higher leverage	New lenders or debt policy
Lower CPI – Central bank relaxes the economy.	Relaxed monetary policy
The lower savings rate for households	Strong currency
Positive “animal spirits.”	Low real interest

Some of these indicators are easier to assess and spot than others. Actual interest rates, higher debt-to-income ratio amongst households, and rapidly increasing prices are indicators we will do an empirical analysis of later.

2.5 Stagflation

Stagflation is a phenomenon where prices rise simultaneously as GDP decreases or plateaus and unemployment increases (Stoltz, 2022). The natural connection between inflation and unemployment is that unemployment decreases when prices rise, as economic activity and demand drive up production; Kindleberger’s theory illustrates this (Grytten, 2022a). According to Kindleberger’s theory, prices rise due to economic pressure, which should lead to lower unemployment and, ultimately, higher GDP. Inflation rising simultaneously as employment and GDP decreases is often caused by exogenous events. An example of such was the increased prices for input factors in the industry during the stagflation of the 1970s.

3. Methodology

To answer the problem, we are going to utilise a computational tool, as well as two empirical methods. We will test for bubbles and deviation from long- and short-term trends by applying a Hodrick-Prescott filter (HP-filter) on time series data. Tobin's Q will be introduced to assess fundamental values in the stock market, and we will use the Taylor Rule to assess whether the central bank has contributed to financial instability through setting the policy rate inaccurately. The Taylor Rule and Tobin's Q will be presented shortly, while the HP-filter will be elaborated in the analysis.

3.1 The Taylor Rule

The Taylor rule is used to examine monetary policies. It can be used in our case to assess whether the central bank has potentially contributed to monetary expansion by setting an interest rate that is too low. It is a simple framework introduced by John B. Taylor (1993) and aims to investigate how a government could obtain stable inflation and economic output. The rule implies that interest rates should be increased in response to high inflation and vice versa (Lønning & Olsen, 2000). Furthermore, it highlights the importance of both the state of the real economy and inflation regarding monetary decisions. It also includes the output gap to indicate the actual economic condition.

The Taylor Rule estimates the Taylor interest rate for an economy based on the neutral interest rate in equilibrium, the inflation rate, and the production gap. Studies conducted by John Taylor in the US in the 1980s discovered that the rate closely matched the interest rate decisions from the US central bank; thus, it has been highly relevant in understanding monetary policies (Lønning & Olsen, 2000).

3.1.1 Hypothesis of Implications

As mentioned, the Taylor rule is an instrument that gives an interest rate as a function of different specific parameters. If this rate differs from the central banks' interest rate over time, it could indicate whether the central bank's policy rate is too high or low over this period.

For our problem, the deviation between the actual policy rate and the optimal policy rate found by applying the Taylor rule is relevant because it can indicate if the Norwegian central banks' interest rate has been lower than the Taylor rate over a more extended period. If this proves accurate, it might indicate that the policy rate has been too low. A lower interest rate than optimal for the economy can, over time, overheat the economy and lead to financial instability.

3.1.2 Calculation of the Taylor Rule

The Taylor rule uses the government inflation target, the neutral interest rate in equilibrium, inflation- and the output gap, which is the difference between the actual and optimal economic output based on assumed trends (Bernanke, 2015). To determine the relative importance of inflation and output gap in policy rate adjustments, the rule introduces reactivity coefficients (α_π and α_y). John B. Taylor proposed using 0.5 for each coefficient, which has become the standard value. What alphas are optimal is disputed, and some studies argue for alternative values for the coefficients.

Furthermore, the Taylor interest rate depends on how the neutral interest rate is defined, a theoretical and unobservable concept (Gerdrup, 2006; Grytten & Hunnes, 2016). The neutral rate is supposed to be the interest rate that maintains the economic equilibrium where the interest rate neither stimulates nor restrains economic contraction. The neutral rate is viewed as non-constant and can change over time, thus reflecting the evolving economic conditions.

The formula for the Taylor rule (i_t) is expressed in the following formula.

$$i_t = \pi_t + r_t^* + \alpha_\pi(\pi_t - \pi_t^*) + \alpha_y(y_t - y_t^*), \quad (3.1)$$

π_t is the inflation in period t , and r_t is the neutral interest rate in the equilibrium during the same time frame. The latter two components represent the inflation- and output gap with their respective coefficients α_π and α_y .

The Taylor rule uses inflation and production gap to indicate the central bank's interest rate policy. The Taylor rule also uses only a few parameters and does not contain all relevant facts about the economy. Despite its simplicity, the rule has proved to be a good tool for predicting the central banks' interest rate (Lønning & Olsen, 2000). Thus, it will be a good indicator for analysing whether the interest rate in Norway has been too high or too low in the last 20 years.

3.1.3 Critique of the Taylor rule

It is essential to keep in mind that the Taylor interest rate simplifies reality. It is based on a few parameters and might not capture the full complexity of real-world conditions; it is likely that, for example, the Norwegian Central Bank bases its decision on a far broader basis for decision-making (Lønning & Olsen, 2000). Conversely, empirical studies have proven that the rule highly aligns with actual economic conditions and outcomes. Thus, it has been used to evaluate monetary policies.

3.2 Tobin's Q

3.2.1 Background for Tobin's Q

Tobin's Q is a financial ratio first hypothesised by Nicholas Odor and later popularised by James Tobin (1966). In essence, Tobin's Q measures whether a firm or an aggregate market is under or over-valued based on market values and reacquisition costs of assets. It measures a firm's or aggregated market's fundamental value through the values of each item they own (Hayes, Q Ratio or Tobin's Q: Definition, Formula, Uses, and Examples, 2021). Historically, it has accurately explained corporate behaviours such as financing, dividends, investments, or diversification strategies (Chung & Pruitt, 1994).

Tobin's Q takes on a value from zero and upwards. In theory, an aggregated market with a value equal to one means acquisition and market values are the same, and there are no good or bad investment opportunities. Similarly, a very large Tobin's Q indicates that the market is generally overpriced, while a low value indicates that the market is underpriced. However, challenges with calculating Tobin's Q accurately mean that the theoretical equilibrium of one is seldom found in modern economies, and the true equilibrium using most practical applications usually gives a value than one.

3.2.2 Hypothesis and Implication

Tobin's Q is a ratio that indicates whether a firm is over- or undervalued. The theory is based on James Tobin's hypothesis that the market value of all assets should equal to their replacement asset value (Hayes, 2021). There are different formulas to calculate Tobin's Q

based on available information and simplifying assumptions. However, they all strive to assess the relationship between fundamental and market values. The ratio gives a value above zero, and James Tobin argued that, on average, it should equal to one.

The ratio can be used to determine whether the prices are over or undervalued. However, as many more factors are in play, it is not an indicator to be unambiguously trusted. Another useful part of Tobin's Q is investigating the developments in the aggregated markets' market value compared to their asset's reacquisition values over time. If Tobin's Q is higher than one in a market, it can be seen as a sign that the market is overheating and that there is perhaps an asset bubble.

3.2.3 Calculations of Tobin's Q

Calculating Tobin's Q is not necessarily straightforward; the original and theoretical formula states the following (Hayes, Q Ratio or Tobin's Q: Definition, Formula, Uses, and Examples, 2021).

$$Tobin's\ Q = Total\ Market\ Value \frac{Total\ Market\ Value}{Total\ Asset\ Replacement\ Value}, \quad (3.2)$$

Tobin's Q equals the total market value divided by the total replacement value of a firm's assets. However, as it is not easy to calculate the correct replacement cost of a firm's value, the following formula is often used by analysts to estimate the real Tobin's Q;

$$Tobin's\ Q = Total\ Market\ Value \frac{Equity\ Market\ Value + Liabilities\ Market\ Value}{Equity\ Book\ Value + Liabilities\ Book\ Value} \quad (3.3)$$

The formula can be further simplified by assuming that the market- and book value of liabilities are often equivalent, as the market value does not often affect a firm's liabilities unless the possibility of default increases by changing the market cap. With this in mind, we can further simplify Tobin's Q as follows:

$$Tobin's\ Q = Total\ Market\ Value \frac{Equity\ Market\ Value}{Equity\ Asset\ Value} \quad (3.4)$$

Challenges with calculating the correct equity asset value mean that we often use book equity values in the denominator and available market prices in the numerator. These are also what we will use in further analysis and are expressed in the following equation:

$$\text{Tobin's } Q = \text{Total Market Value} \frac{\text{Equity Market Value}}{\text{Equity Book Value}} \quad (3.5)$$

3.2.4 Shortcomings of the Simplified Tobin's Q

Calculating the replacement costs can, in some cases, be doable but is often nearly impossible. A good example is the exercise to find the correct replacement values of *Apple Inc.* assets. Valuation of the reacquisition cost of what it would cost them to get their current dominant market position and know-how if they did not already have it shows the challenges with calculating the Tobin's Q. These kinds of challenges are especially true with IT companies, whose primary assets are patents, innovations, market shares, customer loyalty and their skilled workforce (Krishnan, 2023).

When using the simplified Tobin's Q, there are other types of challenges as well. Often, the book value of a company's equity relies heavily on the accounting practices relevant to their jurisdictions (Murphy, 2022). This creates discrepancies between different markets and might give the wrong impression that aggregated markets in some jurisdictions are underpriced compared to others. It is, therefore, essential to ensure equal accounting and valuation practices when comparing different markets. Another similar shortcoming is the correct valuation of real estate.

At the same time, book value can be a correct measurement of industries where assets are depreciated throughout their true lifetime. But historically, we have seen that real-estate firms have huge profits on sales of their properties, which are not accounted for in the book value of equity, but often in their market cap (CFI, 2023).

Even though there are many shortcomings to Tobin's Q, it is still a helpful measurement when looking at an aggregated local market and its developments over time. However, taking the shortcomings into account means it should not be ambiguously trusted as clear proof of overpriced firms or assets, but rather an indicator of overall market directions, and historical comparison. If the simplified Tobin's Q over time moves from 1.2 to, for example, 1.5, it does not necessarily say that the values are now fifty per cent above the reacquisition cost. However, it indicates that the market values have risen relatively more than the acquisition cost of their assets.

4. The Backdrop for Present-Day – Historical Incidents and their Anatomy

In the following chapter, the recent economic crisis' anatomies and incidents shall be explored to gain insight into the backdrop of the current economy. The insights shall later be used to discuss the state of the current economy, as well as a foundation for comparison for the current day economic situation. We will focus on three main crises as a backdrop: i) *The stagflation of the 1970s*, ii) *the jappetid and the banking crisis*, and iii) *the financial crisis of 2008*. Lastly, we will explain more recent developments, such as the recent turbulence with the euro crisis, oil crisis and COVID-19 pandemic. The combined insight from these crises will be part of our discussion's foundation and an important backdrop for the analysis.

4.1 The Stagflation of the 1970s

After the war, between 1950 and 1973, the OECD experienced strong growth, with an average yearly growth rate of 4.6 percent. The economy grew almost continuously, to the point where some economists even claimed to have gotten control over the economy's business cycles (Grytten & Hunnes, 2016). The working class experienced increased purchasing power, and ever more people were leaving the working class in favour of the middle class. This shift in western societies led to a strengthening of purchasing power for the average citizen. The constant growth and prosperity period continued until the 1970s, when a new economic reality set in.

4.1.1 Break from Keynesian Theory

In the 1970s, OECD countries experienced a new phenomenon. According to Keynesian theory, increasing inflation and unemployment were not theoretically possible (Grytten, 2022a). Keynesian theory stated that increased prices were signs that the economy was overheated and in a phase of expansion. Keynes reasoned that inflation was seen when the temperature, or demand in the economy was high. Consumers requested more products than were available, pressing up prices and increasing the need for labourers to produce more. His theory had proved an essential contribution to controlling and adapting financial and monetary policy to cycles for decades, but now met a new challenging phenomenon.

4.1.2 A New Reality

On 6, October 1973, a coalition of Arabic nations invaded Israel to regain disputed territory (Leraand, Yom Kippur-krigen, 2023). After a short period of chaos, the Israeli forces regained control and pushed all attackers back. During the conflict, Israel received widespread support from Western nations, especially the US, through weapons shipments prior to, during and after the confrontation. Even though the main ally of the western block emerged victorious, it proved to be an economic loss.

Arab nations were furious about the defeat and, in large part, blamed the West (Grytten & Hunnes, 2016). Their response was of economic character, and the oil-rich nations decided to utilise the heavy dependency which Western countries had formed on their supply of resources and limit their oil exports substantially, affecting the industrialised Western economies. The result was an oil blockade in 1973 and 1974, known as OPEC 1, and later a second blockade, known as OPEC 2 (Leraand, 2022). Their retaliation had a massive impact on Western economies, which soon came to see their dependence on the Arabic nations' oil reserves.

The industrialised world had become heavily dependent on energy for production and transportation. Thus, when the price of energy increased, the total cost base of both public and private companies increased substantially in Western countries, and margins became narrower, when prices rose (Grytten, 2022a). The increased prices were, therefore, not driven by an increase in demand, as Keynesian theory suggests, but rather by substantially higher prices in industrial input factors. This difference is of the utmost importance, as the latter leads to narrower margins and does not necessarily entail growing economies.

With higher input prices, the *terms of trade* took a turn for the worse (Grytten & Hunnes, 2016). In Norway, we experienced higher import prices than export prices and high inflation. Even though there were challenges in Norway, our economy generally did better than the OECD average. We experienced lower unemployment, lower fluctuations in GDP growth, and, for the most part, lower inflation than our peers.

4.2 Jappetid and the Banking Crisis

4.2.1 Overheating 1982 to 1987

The 1980s and the beginning of the 1990s were dramatic in the context of a changing economic system and national policies (Aamo, 2020). After a period of stagflation, the government felt the need to show political will and ability to improve the situation. At the same time as the West was recovering from stagflation, a right-wing wave of liberalisation swept across OECD countries, leading to a gradual shift away from planned economies in terms of political control over, for example, lending volume and towards more free and open markets. According to the seven-step crisis model, this rapid change could be viewed as a disturbance, kicking off monetary expansion and financial instability.

The liberalisation of credit policy around 1980 and a continued politically decided policy rate to keep housing and other private interest rates as low as possible created the foundations for negative real interest rates (Grytten & Hunnes, 2016). There were negative real interest rates, and a borrowing frenzy ensued. Combined with expansive monetary policies by the government, the economy gradually overheated, with households becoming increasingly more leveraged and purchasing increasingly more goods and services by borrowed money. A state of bubble economy followed. The banks lent out credit in large volumes and took on ever-riskier customers, shifting away from hedge finance.

Politicians deciding the rent below the market value, while the government lifted the restrictions on the banks, who were free to lend to whomever they wanted, created a situation where the rent went ever upwards, opposite of the politically intended developments. With negative real interest rates, asymmetric economic policies and banks with higher leverage and more risky portfolios, the markets entered a stage of nervousness.

4.2.2 Banking Crisis

The overheating led to monetary expansion, overheating, bubbles, and highly leveraged households (Grytten & Hunnes, 2016). Banks had few limits and had been lending money with negative real interest in a newly liberalised economy. Economic growth became ever more

driven by speculation and Ponzi-finance. The situation was unsustainable as a Minsky moment was closing in.

At the beginning of 1986, oil prices fell below ten dollars per barrel, from 40 US dollars at the beginning of the decade (Grytten & Hunnes, 2016). The same year, Norway's trade surplus became a trade deficit. A nervous market, driven to high levels by speculative and Ponzi finance, was also hit by countercyclical policies from the government. When prices started falling, and the government responded with austerity policies, prices fell even further, and real interest rates turned from negative to positive.

The turning point came in September 1987 when the credit bubble burst (Grytten & Hunnes, 2016). The stock market's value was halved in quick succession, real house prices fell by almost fifty per cent, and commercial properties fell even more so. Real interest rates increased simultaneously with bankruptcies and economic downturns. The economy had entered a state of crisis, heavily affecting households and the banks who had uncritically been speculating about lending ever greater amounts in fear of missing out on growth through higher market shares.

4.3 Financial Crisis 2008

After the end of the banking crisis in 1992, the economy again entered a period of strong economic growth (Grytten, 2022b). Even though there was strong economic growth, there were significant global trade imbalances, and many Western countries, such as the US and major European countries, got an increasingly large trade deficit with the growing Chinese economy. China, on the other hand, experienced a large trade surplus driven by, amongst other things, an artificially weak currency.

An imbalance in international trade relations led to unstable international financial systems. This, combined with a banking sector with too few restrictions and too many incentives to keep lending money to increasingly risky customers, led to overheating of the economy and a gradual shift towards ever more speculative and Ponzi finance (Grytten & Hunnes, 2016). The developments were obvious in the US and some smaller nations, e.g., Iceland. The crash was first experienced within loans in the private housing market but gradually on the stock exchange and other investments.

The turning point in the economy came first in the US, when it became apparent that more and more borrowers were not able to pay their debt and chose to do walkouts, leaving their houses and their debt obligations (Grytten & Hunnes, 2016). Investors who had invested their money in subprime mortgages were the first to take on losses. However, as the crisis ensued, it spread to large parts of the housing markets and eventually large parts of the global economy through international propagation.

Table 2: Changes In Macro Sizes in Europe Q2 2008 to Q2 2009
(Grytten, 2022b)

Indicators	Changes in percent
Industrial Production	-21.6
Initiated Housing Construction	-22.0
Relative Increase Unemployment	38.4
GDP Growth	-6.0
CPI Growth	-1.1
Exports	-22.6

The results were significant and catastrophic for the European economy (Grytten, 2022b). As shown in table 2, Europe entered a slump, and the indicators show a struggling economy in depression. The aftermath of the crisis can still be felt in Europe till today, as it led the Eurozone into a state of debt crisis it has yet to recover from fully, as many countries chose to take on the national debt to save the private sector.

4.4 Recent Decades

4.4.1 Euro- and Oil Crisis

The world economy had barely started its recovery from the financial crisis of 2008 when the dawn of a new type of crisis loomed over Europe and the US (Grytten & Hunnes, 2016). The road out of the financial crisis entailed increased public spending when public income decreased

substantially. The effect of these challenges was that a broad set of economies in the OECD countries got enormous public deficits and ever-increasing national debt. Many economies which experienced what started as a financial crisis in the private sector were moved to the public sector, as the situation was dire for big parts of the economy.

Norway managed relatively well through both the financial crisis of 2008 and the still ongoing Euro-crisis (Grytten & Hunnes, 2016). It is questionable whether this is because of exceptional stable governance or if it is mainly held at bay due to our precious natural resources. What is clear, though, is that Norway has skipped most experienced state-financial crises that OECD economies have struggled through.

During 2015 and 2016, oil prices fell drastically, from above 100 dollars per barrel of crude North Sea oil to below 30 dollars (Grytten & Hunnes, 2016). This drastic shift hit the Norwegian economy. Unemployment rose, and the strong growth experienced for many years slightly subsided. However, the mainland economy did not fully enter a recession, and most people could continue their habitual consumption.

4.4.2 Covid-19 Pandemic

During 2020, the world was struck by the COVID-19 pandemic with full force. The effect was an immediate nationwide shutdown of most industries (Tjernshaugen et al., 2023). Stock markets came crashing down, and gross domestic product plummeted during the first few months (Grytten, 2020c). The governments' restrictions meant heavy limitations on the aggregated supply to the economy. Supply-side crises are most common during wars, as demand-side shocks often drive most peacetime crises. The stock markets made a quick V-shaped recovery despite prolonged public restrictions and measures to halter the pandemic.

With negative supply side shocks and markets restricted by lockdown, the government's expansionary economic policies had limited positive effects. The markets that received government support did not bow to the crisis. However, eventually, there was an increase in inflation and only a limited increase in gross domestic product except in the second year of the pandemic (Grytten, 2022c). According to Grytten's COVID-19 model, it can be argued that the demand-side measures when supply and demand are less elastic due to government restrictions, does not contribute to substantial economic growth.

4.4.3 Current Geopolitical Situation

On the 26th of February 2022, the Russian Federation invaded its neighbour Ukraine, and a war of massive proportions was once again fought in Europe. This war, combined with the aftereffects of the COVID-19 pandemic and the decrease in international collaboration and trade, has made input factors such as energy and raw materials much more expensive (Lier & Bach, 2023). The expansive monetary policy from before and during the COVID-19 pandemic contributed to an increase in inflation (Grytten, 2022c). The state of the current Norwegian economy is interesting, as we see high inflation and high monetary policy levels as more and more households experience difficulties in paying their obligations.

5. Data

This chapter will present the various datasets used for the analysis. All the datasets have been collected from publicly available sources, or the Bloomberg terminal, and encompass monthly, quarterly, or yearly data. After describing the datasets, we will discuss their validity and reliability. Lastly, we will address the limitations and shortcomings of the dataset.

5.1 Review of the Data Material

5.1.1 Gross Domestic Production

Gross domestic product (GDP) measures all goods and services produced in an economy throughout a year minus the costs that occur during production (SSB, 2023b) Thus, it is a good measurement of the total value created in a country's economy. It is worth mentioning that GDP is not entirely accurate since it does not consider externalities such as domestic work. However, it is still considered one of the best measurements of economic prosperity and developments in the value creation of an economy.

Due to the Norwegian economy's high dependence on oil and gas, it is normal to separate the GDP coming from the mainland and the offshore activities (SSB,2023ba). This paper will focus on the mainland GDP, which includes all industries except oil and gas extraction, pipeline transport, and foreign shipping.

The dataset is gathered from the Norwegian central bank, *Norges Bank* and includes yearly numbers of GDP and GDP per capita stretching back to 1819. Furthermore, quarterly data stretching back to January 1978 has been gathered from the *Statistics Norway*, hereafter SSB.

5.1.2 Household Consumption

Household consumption is defined by the household's expenses related to purchasing goods and services (SSB,2023c). It will be interesting to include data on private household consumption as private consumption is a crucial macro size that is important for understanding changes in investments and GDP. Thus, fluctuations in private consumption will affect the

general demand in the market. The dataset for private consumption is gathered from SSB and contains quarterly data from the first quarter of 1978.

5.1.3 Gross Total Investment

The gross total investment is the amount of gross investment in fixed real capital, including inventory change and net acquisitions of valuables (SSB, 2023c). The development of gross total investment gives information about the level of economic activity. It also indicates the confidence investors have in the economy's future growth. Investment tends to be lower when it is believed that future economic growth prospects are poor and higher when there is a stronger belief in economic growth. The dataset for gross total investment is gathered from SSB and has quarterly data from the first quarter of 1978.

5.1.4 Housing prices

For the historic banking crisis, housing prices and cracks in real estate markets have proven to be one of the most reliable indicators of economic crisis (Reinhart & Rogoff, 2009). Thus, the development in Norwegian housing prices will be highly relevant when examining the underlying financial stability of the Norwegian economy.

From *Norges Bank*, we have gathered data on Norwegian housing prices from 1819 to 1989. This data has been merged with data from 1985 to 2013 from the Norwegian Homeowners Association (Norges Huseierforbund) and data from Statistics Norway from 1992 to 2022. To make a time series of the development in housing prices from 1819 to 2022, we had to concatenate the three different time series into one by assessing growth relationships between the different sets.

5.1.5 Money Supply

Money Supply (M2) is a measurement of the amount of money in the economy. This includes cash, currency in circulation, commercial bank deposits, and certain savings accounts (SSB, 2023d). Therefore, the M2 gives a good picture of how much money is available in the economy. We chose M2 and not M1 because M2 also includes liquid assets that will not necessarily be spent directly as cash in the imminent future but hold the possibility of being

converted and spent as highly liquid assets. This makes M2 more comprehensive; hence, we get a better overview of the money supply in the economy.

We gathered data from Norges Bank and SSB to examine the money supply M2. *Norges Bank* had yearly numbers on M2 from 1819 to 2016 and SSB until today. Thus, we concatenated the data, so we got a new dataset with yearly numbers on M2 from 1819 to 2022. This dataset is suitable for analysing the long-term trends in the development of M2.

Furthermore, we also wanted to look at the short-term development of M2. Thus, we gathered monthly data from SSB from January 2008 to July 2023. This monthly data could give us a more precise analysis of the short-term development than the long-term yearly dataset. On both the long- and short-term datasets, we used the HP-filter to analyse trends and deviation, with a lambda of 100 on the long-term and 4200 on the short-term.

5.1.6 Debt

The level of debt serves as a good indicator of how vulnerable the economy is. If the level of debt is unnaturally high, the economy is less resistant towards negative economic shocks, making the economy less financially stable. To investigate developments in leverage amongst private consumers and households, we have collected data on household debt to income.

The data on household debt based on income ratios is gathered from Statistics Norway. We have used quarterly data from the fourth quarter in 2002 to the second quarter in 2023.

5.1.7 Policy rate

We have chosen to look at the central bank's policy rate to analyse how Norges Banks navigates the economy through its monetary policy. The central bank contributes to financial stability by providing information to other hegemony powers through communication using both annually and quarterly reports. The policy rate is an important factor to look further into since the rate is easy to measure and directly affects the Norwegian economy. Changes in the policy rate indirectly affect what interest rates businesses and private households must pay. Data on the policy rate is gathered directly from *Norges Bank*.

5.1.8 Inflation – Consumer Price Index

We use the consumer price index (CPI) to measure an economy's inflation. The consumer price index measures the general development in consumer prices for goods and services that Norwegian households demand (SSB, 2023e). As the ordinary CPI also includes goods and services that vary a lot in price and have significant fluctuations, we have chosen to use measures on core inflation when calculating the Taylor rule. We will, therefore, be using the *consumer price index adjusted for tax changes and exclude energy*, CPI-ATE. The index will have less variation without energy prices and fee changes.

Data on annual core inflation from 1819 to 2019 is collected from Norges Bank, and from 2019 to 2022, it is sourced from SSB. For monthly and quarterly data from the year 2000 to October 2023, we have used SSB.

5.1.9 Unemployment

The level of unemployment in an economy could be an indicator of the economic activity within a country (Fuhrmann, 2023). In good times with high economic activity, unemployment is often low, while in economic downturns, the rate tends to go up as demand for goods and services reduces. During economic cracks followed by crisis periods, unemployment tends to increase substantially.

From the Norwegian Labor and Welfare Organization (NAV), we have yearly data from 1948 to 2022 on the long-term total unemployment of the workforce. The workforce is defined as people participating in the labor market, searching for or occupying a job (NAV, 2023ba). People who are unable to participate in the labor market, such as those who are out of work due to long-term injury, are excluded from the statistics.

We have gathered data on total unemployment from SSB from January 2006 to October 2023 for monthly unemployment. SSB defines total unemployment as people actively searching for jobs or have been without a job for at least two weeks (SSB, 2023f).

5.1.10 The Neutral Interest Rate

When estimating the Taylor rate, one of the input factors is the hypothetical neutral interest rates. In the quarterly monetary policy report from Norges Bank (2023cb), the central bank made estimates of what the neutral interest rate could be. These estimates went from 2004 towards 2022. For further analysis, we have assumed an annual constant neutral interest rate based on the average of the bank estimates.

5.1.11 Production Gap

The production gap is the difference between what is produced in an economy and what should be produced under normal circumstances without deviation from long-term trends (Norges Bank, 2023c). If the production gap is positive, and the economy has growth rates above the middle-term trend, the economy is in a boom. When production and growth are lower than the long-term trend, and there is a negative production gap, the economy is in a slump or an economic bust.

To find the production gap in the Norwegian economy, we have based the data on different monetary policy reports of the Norges Bank. The production gap could have been estimated using the HP-filtered GDP trend cycle deviations. However, we have chosen to keep our own HP analysis and our estimation of the Taylor rule separated.

5.1.12 Oslo Børs Benchmark Index

The market value of the Oslo Stock Exchange Benchmark Index (OSEBX) can be an indicator of financial activity, overheating and future expectations in the Norwegian Economy. We have monthly historical stock price indices from 1914 to 2003 from Norges Bank. From 1996 to 2023, monthly data were gathered from Bloomberg. Since the different time series have used different reference indexes, we concatenated them into one index by finding their relative sizes and adapting the older index to the present-day benchmark. Equity book values matched with the index values were gathered from *Bloomberg*, with data from 1996 to 2023.

5.2 Reliability and Validity

For our findings and conclusions to be trustworthy and reliable, it is essential to use data with high validity and reliability. Therefore, the following subsection is aimed at understanding the validity and reliability of the data, as well as potential challenges we need to be aware of. Validity is whether the factors we analyse are fitting to say something about the overall problem we are trying to find the answer to (Dahlum, 2023), while reliability is whether the data is consistent and the possibility that the dataset might be biased (Svartdal, 2023).

5.2.1 Reliability

Measures to test Reliability are used to assess the accuracy of data. In other words, they determine whether we can trust the data and whether it is reliable and consistent. Most of the data is sourced from well-established and reliable sources, making it reasonable to believe it is dependable. SSB and *Norges Bank* are both public, well-known, and trusted. Most of our data also consists of straightforward observations of critical economic factors, such as interest rates. Therefore, the likelihood of encountering highly incorrect data is very low.

Nevertheless, some factors may lead to some level of uncertainty. Gross domestic product is calculated using a combination of various statistics. These statistics are often collected from companies, enterprises, households, and various data sources (SSB, 2023cb) which can introduce some inherent uncertainty regarding the precision of each statistic. Real-time issues make it more difficult to calculate the exact GDP in real-time, meaning the most recent GDP numbers are estimates that may differ slightly from the actual figures.

Furthermore, there are uncertainties associated with the measurement of inflation. What factors are to be included, and their weighting is essential in calculating inflation. Statistics Norway obtains their data from various sources. Based on analyses conducted to assess the accuracy of the CPI index, studies from Canada, the USA, Sweden, and Great Britain estimate that the measurement error falls within the range of 0.4 to one percent (SSB, 2023e). SSB is highly confident that their figure is well below one per cent. Reliability, therefore, seems acceptable.

Some datasets are time series that stretch back for decades and, in some cases, centuries. The further into the past, the time-series stretch, the more uncertain the estimates will be due to the

less precise measurements. The challenge of estimating historical numbers correctly can, therefore, be a potential problem to the reliability of the paper. However, since we are analysing the development of the Norwegian economy over a more extended period, we believe these uncertainties would be trivial, thus, we can rely on the data to be accurate enough to answer our problem thesis.

5.2.2 Validity

When assessing the validity of the data, how accurate the measures and factors we are examining are to tell something about the phenomenon we are studying is important. Thus, it must be considered if the data used is suitable to draw some conclusions regarding the problem in question.

This paper analyses the current state of the Norwegian Economy in relation to Grytten and Hunnes' seven-step-dynamic crisis. We are using key economic indicators such as GDP, CPI, housing prices, OSBX index, money supply, policy rate, level of investments in the Norwegian economy, and level of household debt and consumption. We believe the key macroeconomic factors will give an excellent foundation to analyse the overall historical trends in the Norwegian economy and recent developments. The data seems to have strong validity but with some challenges.

Over the last 20 years, the Norwegian Economy has had a relatively high economic growth rate. Some time series used in the analysis only contain data from this period of strong growth, which may lead to biases. Thus, when using the data with a constant strong growth trend in the analysis, we might not spot the deviations from historical trends due to the underlying high economic growth, making unusual values seem normal in our trend analysis.

To counter short-term problems, we also use annual data stretching back decades and centuries. This gives us a more nuanced picture of the economic trends, reduces the risk of making assumptions based on biased data, and lets us problematize the findings only based on data from the last 20 to 50 years. Therefore, we can interpret the economy's short- and long-term developments using both short-term and long-term data series.

Furthermore, a limitation regarding real estate prices is the absence of data on commercial property prices. Commercial property is an important indicator of financial stability in a market

and therefore, an important part of the Norwegian real-estate market is left out of the analysis (Norges Bank, 2020). We did not include commercial property in our analysis as SSB and the *Norges Bank* do not publish data as high quality as other macroeconomic factors for price development. If we had been able to include commercial property data, our analysis of prices in the real estate market would have been more comprehensive and robust. In addition, most of the data we use on real estate prices does not consider the improved housing standards that have gradually increased throughout the century, leading to increased fundamental values.

Another weakness in the data is her approach to assessing levels of debt. We have primarily used debt to household income amongst consumers. The analysis and the value of our conclusions could have been strengthened by adding an analysis of national and corporate debt and leverage, as these numbers are also significant for assessing the state of the economy.

During COVID-19, there were unnatural shifts in GDP and private consumption due to social restrictions during the first months, followed by higher consumption after the pandemic (Grytten, 2022). These large, unnatural outliers might affect our data, especially when using GDP to deflate other factors to an unnatural large degree, and this is something we need to be aware of when discussing our findings.

Another potential conflict with validity is the variety of the companies listed on The Oslo Stock Exchange. Companies from the oil, fish and shipping industries highly dominate the stock exchange (Wasberg, 2022). This paper mainly focuses on the Norwegian mainland economy, but the stock exchange consists of many companies that operate outside of the Norwegian mainland economy. The data could, therefore, be more valid if we could balance out the indexes, lessening the impact of oil, fish, and shipping-related industries.

6. Analysis

This chapter consists of six parts:

- i)* an introduction to the computational tool, the Hodrick-Prescott filter.
- ii)* a trend analysis, using the Hodrick-Prescott Filter to investigate; housing prices, inflation, GDP, gross total investments, household consumption and the money supply.
- iii)* an analysis of the interest rates and debt levels, relying on Taylor rule, debt to income levels and real interest rates.
- iv)* developments on the OSEBX, including a HP analysis of the stock index and Tobin's Q.
- v)* a Minsky moment analysis, before
- vi)* discussing shortcomings of our analysis.

6.1 The Hodrick-Prescott Filter

To map periods of financial up- and down-turns in the economy, we seek to measure long- and short-term cycles within structured time series. The Hodrick-Prescott filter, hereafter the HP filter, was first introduced by Sir Edmund T. Whittaker in 1923 (Whittaker, 1923), and later popularized by economists Robert J. Hodrick and Edward C. Prescott in 1997 (Hodrick & Prescott, 1997). The HP-filter retrieves a smoothed, non-linear time series that emphasises long-term effects over short-term deviations. We want to investigate both with a higher emphasis on long-term cycles and the more traditional lambda values used for the HP-filters. By using a structural time series analysis separating an observed time series (x_t) into a trend component (g_t), a cycle component (c_t), a seasonal component (s_t) and an irregular component, with (t) indicating time, we get the following:

$$x_t = f(g_t, c_t, s_t, i_t) \quad (6.1)$$

by applying an arithmetic approach to equation (6.1), we get the following arithmetic relationship:

$$x_t = g_t + c_t + s_t + i_t \quad (6.2)$$

when further considering as a residual, we get equation:

$$x_t = x_t - (g_t + c_t + s_t) \quad (6.3)$$

In this, the irregular component (i_t) and the seasonal component (s_t) can be seen as part of the cycle component (c_t). By applying this knowledge to equation 6.2, we arrive at the following results:

$$x_t = g_t + c_t \quad (6.4)$$

We can now apply a Hodrick-Prescott filter to identify the components in equation 6.4. The Hodrick-Prescott filter minimises the cycle component's variance (c_t) by adjusting for the second difference of the trend component. More precisely, the HP filter defines the trend g , which minimises equation 6.5:

$$\sum_{t=1}^t (x_t - g_t)^2 + \lambda \sum_{t=2}^{t-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2 \quad (6.5)$$

In equation 5, $(x_t - g_t)$ gives the cycle component, and $(g_{(t+1)} - g_t) - (g_t - g_{(t-1)})$ shows us the difference between the trend component in t and $t+1$. Lambda (λ) is the smoothness parameter for the growth component in the time series.

By choosing a higher lambda value, the importance of the cycle component will become more prevalent. In comparison, a lower lambda value indicates that more short-term changes observed are part of the actual trend. The cycle component can, therefore, be found by the following equation:

$$c_t = x_t - g_t \quad (6.6)$$

The most common values for lambda for various time series are $\lambda = 100$ for annual figures, $\lambda=1600$ for quarterly figures and $\lambda=14'400$ for monthly figures (Grytten & Hunnes, 2016). We have chosen to use these, and even greater lambda values to investigate even further macro-trends than what the standardised lambda values are optimal for.

6.1.1 Relative Cycle Analysis

Using logarithmic values is useful when calculating relative cycles. We have, for our analysis, opted for natural logarithms, \ln , of the parameters x_t and g_t , which gives the following implicit logarithmic values (6.7):

$$\ln(c_t) = \ln(x_t) - \ln(g_t) \quad (6.7)$$

By applying the HP filter from function (5) to function (7), we get the following function (8):

$$\sum_{t=1}^t (x_t - g_t)^2 = x_t + \lambda \sum_{t=2}^{t-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2 \quad (6.8)$$

In function (6.8), the cycle component, $\sum_{t=1}^t (x_t - g_t)^2$, constitutes the residual. When applying this to function (6.7), we arrive at:

$$\ln \ln(c_t) = \ln \ln(x_t) - \ln \left(\lambda \sum_{t=2}^{t-1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2 \right) \quad (6.9)$$

The lambda functions as the smoothing parameters. With Lambda closer to zero, more of the changes in the time series are attributed to the trend. In contrast, larger lambda values attribute a more significant portion of the time series variation to cyclical changes. From this, it is apparent that we find more significant cyclical deviations with larger smoothing values, and vice versa.

6.1.2 Minsky Moment Analysis

The HP-filter establishes the long-term trend within a structured time series. Previously, we have explained how to use this to find deviations from the long-term trend to uncover cycles. Another possibility with the HP filter is to investigate the trends to find where they shift from growth to degrowth. This can be done visually by checking the plotted trend or calculating the first and second derivatives. Using function (6.6) above as a point of departure, we get the following derived function (6.10):

$$c'(t) = \frac{d}{dt}(x_t - g_t) = \frac{d}{dt}x_t - \frac{d}{dt}g_t \quad (6.10)$$

As x_t and g_t are functions of time, t , we can apply the Chain rule for derivation to end up with the following derived function:

$$c'(t) = x'(t) - g'(t) \quad (6.11)$$

Function 6.11 gives us the exact extremal locations for the trend component in the data series. If we also want to find when the growth goes from acceleration to stable growth and vice versa, we want to find the second derivative. By applying the second derivative on function 6.11, we end up with the following result:

$$c''(t) = \frac{d}{dt}(x'(t) - g'(t)) \quad (6.12)$$

Once again, applying the chain rule for derivation, we end up with the following second derivative:

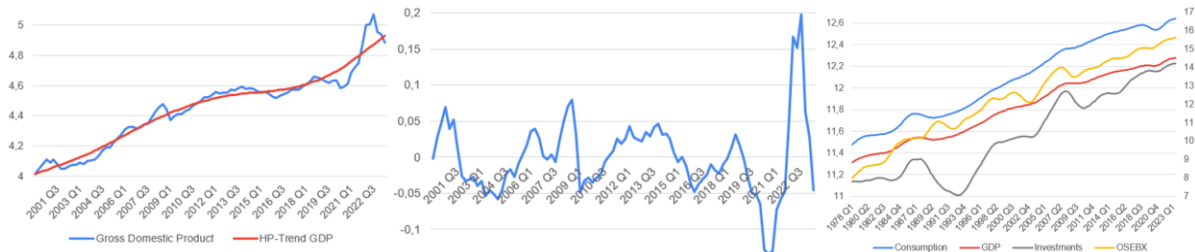
$$c''(t) = \frac{d}{dt}x'(t) - \frac{d}{dt}g'(t) \quad (6.13)$$

When conducting the Minsky moment analysis, one searches for turning points on the HP trend where the derivative is zero and the double derivative is negative. A high lambda value is useful when investigating deviation from the long-term trends. However, a low lambda value will make the analysis more focused on the trend and less on the cycles. Thus, it is recommended to be conservative when applying the lambda value to the Minsky moment analysis. Hence, one can use values between 25 and 100 for annual and quarterly data.

6.1.3 Usage of the Hodrick-Prescott -filter

As mentioned earlier, we will use the HP filter to i) estimate trends of structured time series, ii) identify cyclical deviations/ production gaps in these periods, and iii) say something about uncertainty and Minsky moments in the markets. The visual presentation of these analyses is exemplified below with GDP.

Figure 8 & 17) Illustrations from our analysis (Bloomberg, 2023; Eithreim et al., 2004; SSB, 2023h; SSB, 2023i)



The graph to the left exemplifies how the HP filter can be used to view long-term trends, the graph in the middle shows cyclical deviations, and the one to the right shows how the isolated trend component can evaluate uncertainty and turning points.

6.1.4 Shortcomings of the Hodrick-Prescott -Filter

The HP-filter is somewhat effective in calculating the long-term trend component for large datasets. It does, however, have some shortcomings. These are, amongst others, endpoint issues, real-time issues, and similar weightings for upturns and downturns in the economy (Hamilton, 2017). These issues make certain results less valid but do not invalidate the use of the HP-filter for all purposes.

Endpoint issues

Endpoint issues are a significant challenge when using the Hedrick-Prescott filter to estimate the current situation (Hamilton, 2017). The HP-filter utilises both data before and after the point in time we are trying to estimate to calculate a trend at each point in time. The closer the dataset gets to the end of the data set, the less future information the analysis can base its results on. A significant implication of this is that if we have been in a period of overheating, with shift to speculative- and Ponzi finance, and there exist bubbles that have been growing at a steady phase for long enough, the HP-filter will show that this is the actual trend. In this situation, even though it is easy to tell in the future when we use the HP-filter on a bubble that has already burst, it is nearly impossible to use quantitative calculations alone to uncover bubbles in real-time.

Real-time Data Issues

Calculating the correct input values can often be difficult when using data close to current times. An example is how GDP is often more accurately calculated after a year or an event and not necessarily in real-time. Other examples might be inflation, exports/imports, or total investments (Audoly et al., 2023).

6.2 HP-Trend Analysis

In the following, we are going to use the HP-filter presented above to analyse trends and business cycles in various key macro indicators. This will give us the empirical foundation necessary to answer the problem thesis.

6.2.1 Housing Prices

Housing prices are relevant when considering financial stability for various reasons. The most obvious is the importance of housing prices for historical economic crises, such as *Kristianiakrakket* and *the financial crisis in 2008*, as explained previously (Grytten & Hunnes, 2016). Many economic crises have started by cracks in the housing market, affecting banks and their ability to commit loans in rapid succession. Also, housing prices are tightly tied with household investments, representing most private household debt (SSB, 2019).

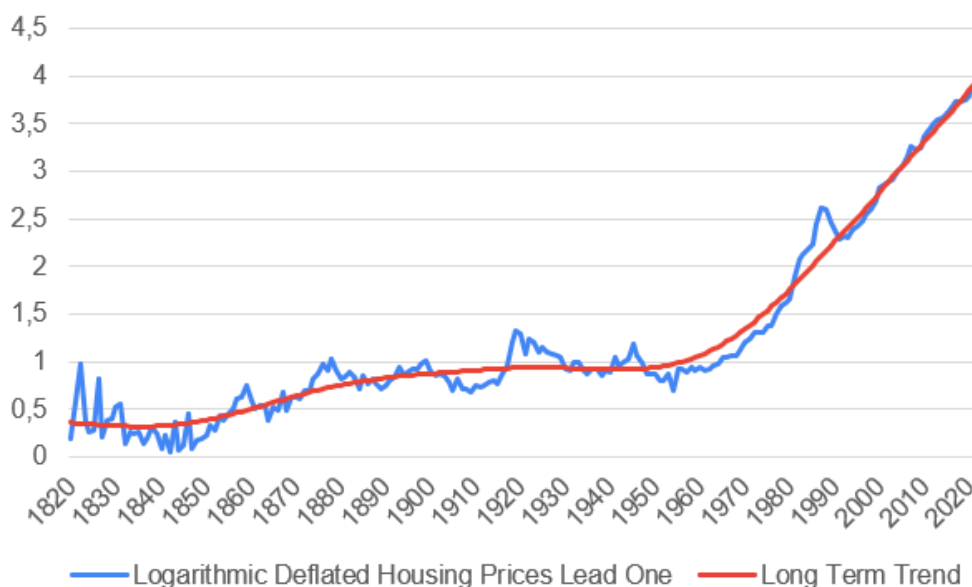
Analysis of Housing Prices

We used logarithmic values of the housing prices to analyse the relative development over time. To take the solid economic growth observed in the last decades into account, we deflate the housing prices with the increase in GDP per capita. We did this by deflating the logarithmic numbers of housing prices with the logarithmic values of GDP per capita. Thus, the overall growth in the Norwegian economy has been considered and does not affect the housing prices to the considerable extent it would have done otherwise. By doing this, we want to separate the increase in housing prices caused by general economic growth from that caused by other factors such as shortage in housing, population growth, too low stable interest rates, and speculation in the housing market.

HP Filter Annually

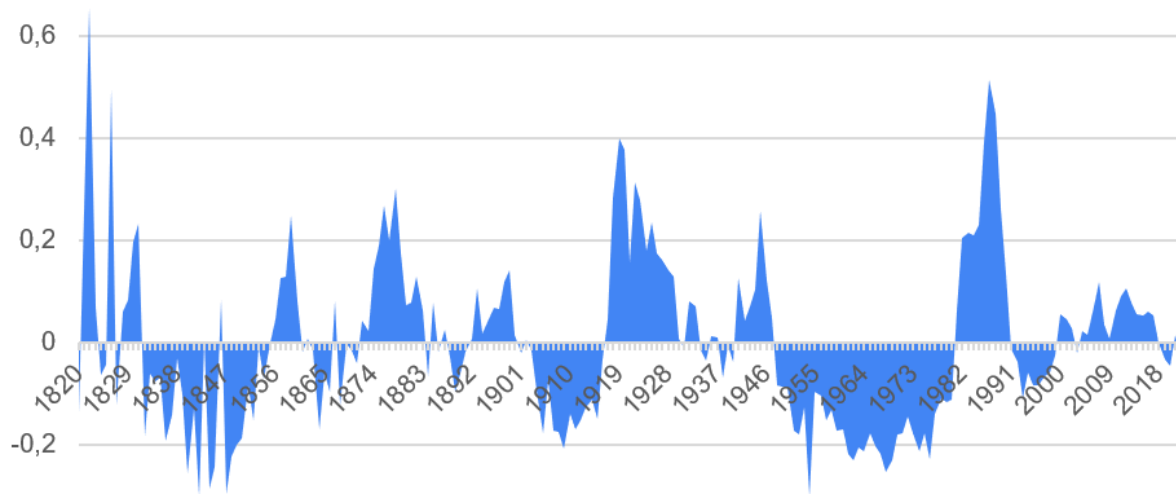
We get the results below by applying an HP filter to the yearly data from 1819 to 2022, with a lambda value equal to 14 400 fit for very long-term analysis with annual data. The plotted deflated growth shows stable and relatively modest long-term growth for most observed data until the 1960s. From the 1960s until today, deflated housing prices have skyrocketed, increasing more than ten times and at a far higher pace than prices have historically. High and low conjunctures are visible, but the absolute growth in deflated housing prices is the most visually striking. We have decided to do a cycle analysis to determine the fluctuations in the HP trend.

Figure 3: Long-Term Growth in Deflated Housing Prices
(Norges Bank, 2023 c; Grytten, 2004; Klovland, 2013)



We get the graph below when looking deeper into the cycles and deviation from the long-term HP-trend. The graph efficiently uncovers historic crises such as the *jappetid* and the following banking crisis of the 1980s and 1990s. When looking at the years since the turn of the millennium, there have been primarily periods of moderate booms, and busts have followed periods of booms only to a minimal degree.

Figure 4: Cyclical Deviations from Long-Term Trend Housing Market
(Grytten, 2004; Klovland, 2013; Norges Bank, 2022a)



Findings

When looking further at the increase in prices to analyse the total change from 1819 until today, we decided on sorting the time series into three periods: i) before the *Kristianiakrakk* in 1899, ii) from the *Kristianiakrakk* until 1969, and lastly, iii) from 1970 until the present day. Housing prices are deflated by GDP per capita, and average yearly growth is calculated year-on-year, while total increase is calculated from the first to last year in the period.

Table 3: Periodic Growth in Housing Prices
(Grytten, 2004; Klovland, 2013; Norges Bank, 2022a)

Period	Average annual increase in deflated housing prices in percent	Total increase in deflated housing prices in percent
1819 to 1899	2.27	65
1900 to 1969	0.37	21
1970 to 2022	5.30	1071

As shown in table 3, between 1819 and 1899, there was only a relatively moderate increase in housing prices, totalling at only two thirds increase. At the turn of the last century, until 1969,

this growth was decreased even further, and the yearly price increase was almost non-significant.

The growth rates before the last fifty years are considerably lower than the growth in prices observed since. Between 1970 and 2022, prices have risen at a much higher pace and have increased by more than 1071 percent in total. This means prices are more than tenfold higher today than in 1969, deflated by GDP.

6.2.2 Consumer Price Index

Inflation can be a significant contributor to both financial stability and financial instability, with changing policies throughout the centuries regarding inflation, from the golden and silver standards of the 1800s and early 1900s, with par-policies and the like, to present-day's outspoken goal of stable and low inflation. With current policies targeting yearly inflation of 2.0 percent from 2018 to today and 2.5 percent from 2001 to 2018, the Norwegian hegemony powers seek to ensure the best possible terms for the Norwegian economy to have stable and predictable conditions and economic growth. Historically, high inflation has been related to periods of high economic growth. Still, it can also easily lead to periods of overheating in the economy, purchasing power erosions, weakened currencies and uncertainty for investors and consumers. In some exceptional cases, high inflation might happen simultaneously as economic growth slows down, leading to stagflation, as seen in the 1970s.

Analysis of Consumer Price Index

We have looked at yearly data on inflation, dating back to 1805, and monthly data since the government began its stable inflation policies in 2001. For the long-term data, reaching back to 1819, we have opted for a visual descriptive analysis. At the same time, we have analysed the monthly data back to 2001 based on its deviation from the targeted inflation rate. Lastly, we have structured the main findings in a table.

Long Term Consumer Price Index

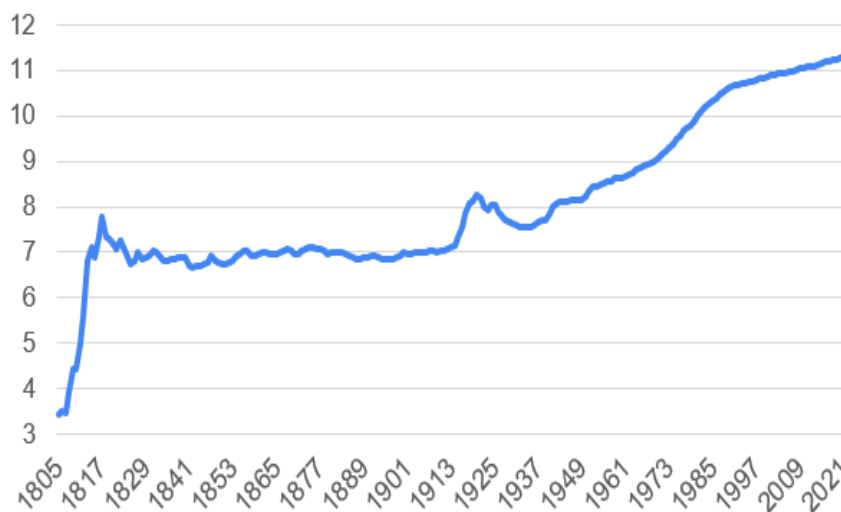
Several historic incidents become apparent by looking at the long-term development in inflation and the consumer price index. First and foremost, there was massive and unprecedented inflation during the Napoleonic wars, which then slightly stabilised during the more peaceful years after the establishment of the Norwegian constitution. The century was characterised by

the ambition to keep the currency connected with gold or silver, leading to only short periods of substantial deflation and inflation.

The first significant incident affecting inflation substantially after the Napoleonic wars was the First World War. Inflation skyrockets before it once again lowers. The period with deflation following the First World War and the post-war boom is known as the *Pari crisis*, a period where the central bank's primary goal was to have the currency reach pre-war values.

Jumping forward nearly a century, starting in 2001, the government began its stable inflation policies. This is clear also from the historic inflation rates between 2001 and 2022. In this period, the previously accelerating inflation experiences a deceleration as a result of altered policies, maintaining inflation at a lower and stable rate.

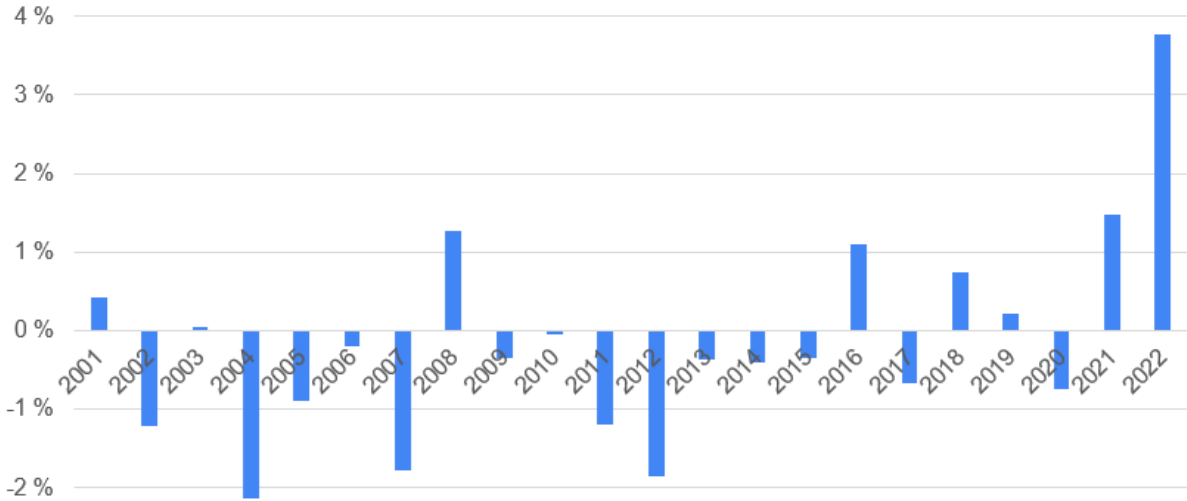
Figure 5 *Logarithmic Historic Inflation (Grytten, 2004; Klovland, 2013)*



Deviation from targeted inflation

When looking deeper into the development of inflation since the turn of the century, it is helpful to see how it deviates from the targeted inflation rate of 2.5 and 2.0 percent. We got the following results by subtracting the target inflation rate from the measured yearly inflation based on year-on-year growth in the consumer price index.

Figure 6: Yearly Deviation From Targeted Inflation 2000 to 2021
(SSB, 2023g)



What is interesting is the long period of meagre inflation prior to the 2008 financial crisis, followed by an increase in 2008. The period leading up to 2008 was characterised by strong economic growth but inflation is still low. After 2008 until 2016, inflation again fell below the target rate, but usually not by a very substantial amount. The two most significant outliers in terms of high inflation are the last two years of the data set. In 2021 we find inflation at three quarters above targeted rate, while it is almost triple the size in 2022.

When looking at preliminary numbers for 2023 (January until October), we find an average annualised yearly inflation of 6.2 percent, which is more than four percentage points higher than the target inflation rate.

Findings and their implications

Structuring the findings into table 4, we find the average inflation in various periods from 1819 till today.

Table 4: Average Annual Inflation and Deviation From Target, Selected Periods, (Norges Bank, 2022a; SSB, 2023g)

Period	Sequence	Average annual inflation in percent	Average deviation from target inflation in percentage points
1819 to 2022	Yearly	2.2	N/A
2001 to 2022	Yearly	2.2	N/A
2001 to 2018	Semi-monthly	1.96	-0.54
2018 to 2022	Monthly	3.47	+1.47
2020 to 2022	Monthly	4.18	+2.18
2023 Jan to Oct	Monthly	6.17	+4.17

As shown, between 2018 and 2022, the average annualised inflation rate was far higher than the periods prior. When looking at the monthly data after the beginning of the 2020 COVID-19 pandemic, the increased inflation becomes even more apparent, and especially the first ten months of 2023 have seen unprecedented inflation for recent economic history.

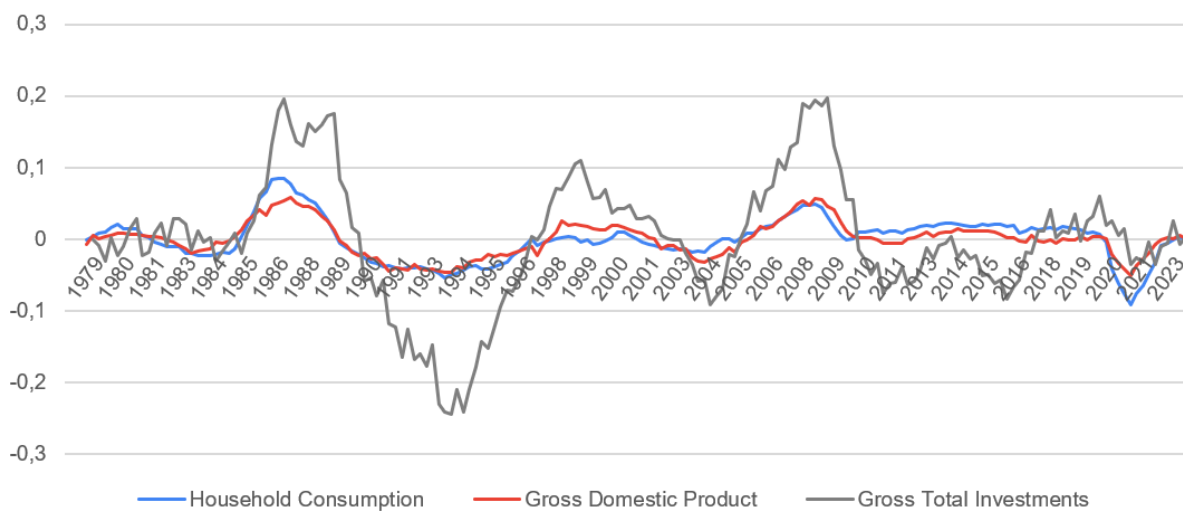
6.2.3 Gross Domestic Product, Gross Total Investment, and Household Consumption.

When assessing the state of the economy, it is vital to also look at the development in GDP, gross total investments, and household consumption. All of these are somewhat intertwined, as increased household consumption naturally leads to more economic activity and increased GDP, followed by more positive outlooks and higher investments (CFI, 2023). GDP gives a strong indication of how the economy in general is going and has, from a historical perspective, rarely had prolonged periods of decline. Some periods of contractions are usual in times affected by the crisis, and growth above the trend can often be found in times of overheating. Even though prolonged periods of contractions are rare, even short periods of contractions in GDP are experienced quite dramatically by private consumers. Gross total investments are often more cyclical and, therefore, show more significant deviations from the trend. Household consumption has historically followed GDP closely.

Cyclical GDP, GTI, and HC

Quarterly data on GDP, gross total investments, and household consumption from 1978 until the second quarter of 2023 has been transformed to logarithmic values before applying an HP-filter with lambda equal to 126'000. When assessing the cyclical values, we opted for smoothing the data with a five-period smoothing average.

Figure 7: Cyclical GDP, Gross Investments and Household Consumption (SSB, 2023h)



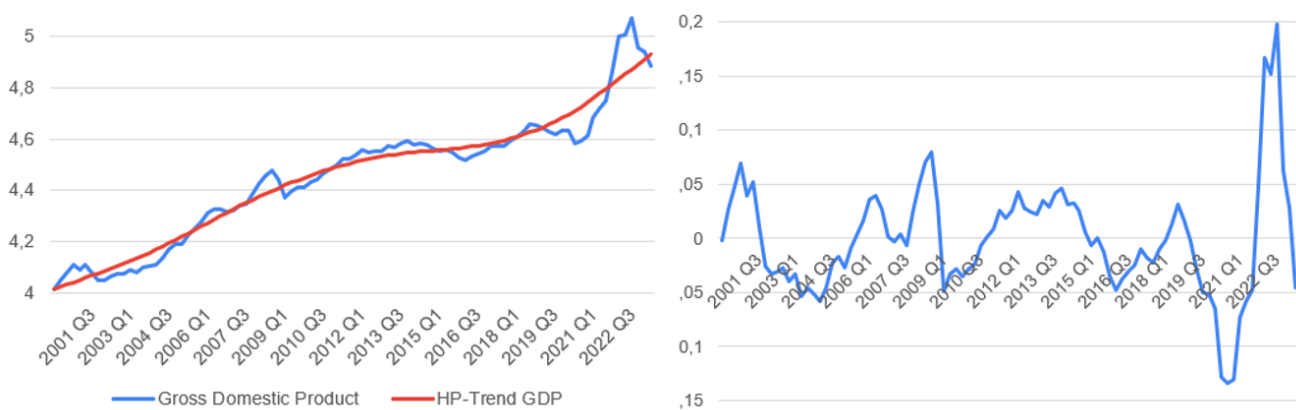
From the figure above, it is evident that the development of GDP, household income and gross total investments are correlated. Household consumption, as well as GDP, are procyclical, while gross total investments are the most volatile indicator. For all indicators, events such as the overheating of the 1980s, the banking crisis, the dot-com crisis as well as the financial crisis become apparent through booms prior to the cracks, followed by subtraction in all indicators. These indicators, therefore, seem fitting to identify historical incidences.

The historic, very close ties between investments on one side and GDP and household consumption on the other are weaker between 2010 and 2017, where GDP and household income are still above the long-term trend, while investments experience a downturn. This might indicate a relatively high consumption compared to investments during this period, which the economy might see the effects of further down the road when the results of lower investments and savings during the 2010s start showing. After 2017, household consumption, GDP and total investments regained their close covariation.

Quarterly GDP growth to 2023

When focussing solely on quarterly development in GDP from 2000 to 2023, it is easier to spot the major developments of the last decades. In general, the growth trend in GDP has been positive. The projected HP-trend shows a sharp increase from 2018 until 2023, despite less economic growth in 2020 and 2023 compared to the trend. This is much abided by the abnormal rise in GDP in the first to the third quarter of 2022, perhaps due to capital accumulation during the COVID-19 pandemic, where consumers were less able to spend their money, but still earned about the same. The GDP has since declined and is now in line with pre-corona trend levels. When looking at cyclical values, it becomes apparent that there was a major decrease during the coronavirus and that we experienced a short but solid post-corona boom in the economy. The boom was short-lived, and as of the end of the second quarter of 2023, the quarterly GDP is near the HP growth trend.

Figure 8: Long Term HP-Trend in GDP and Cycle Deviation (SSB, 2023i)



The findings of growth in gross domestic product and household income is visualised in the table below:

Table 5: GDP and Household Consumption Growth (SSB, 2023i)

Period	Sequence	Avg. Yearly growth GDP in percent
2001 to 2022	Yearly	2.38
1978 to 2022	Yearly	2.42
Q1-2019 to Q2-2023	Quarterly	8.85/ 7.6

		Average quarterly growth Household income
2001 to 2022	Quarterly	0.73
1978 to 2022	Quarterly	0.84
2019 to 2023	Quarterly	0.36

As seen in table five, yearly growth between 2001 and 2022 is very closely identical to the yearly growth between 1978 and 2022. Since Corona, the development has changed substantially, with periods of strong growth as well as sharp declines. The annualized yearly growth between 2019 and the second quarter of 2023 is more than three times the average between 1978 and 2022.

The developments in household consumption for the same period are fascinating. There is a clear correlation between the two during the two first periods. From 2001 to 2022, household consumption rose by an average below one percent quarterly, with similar growth numbers for the entire period. Despite household consumption often being pro-cyclical with GDP, we find a decrease in quarterly household consumption from the beginning of the COVID-19 pandemic till now.

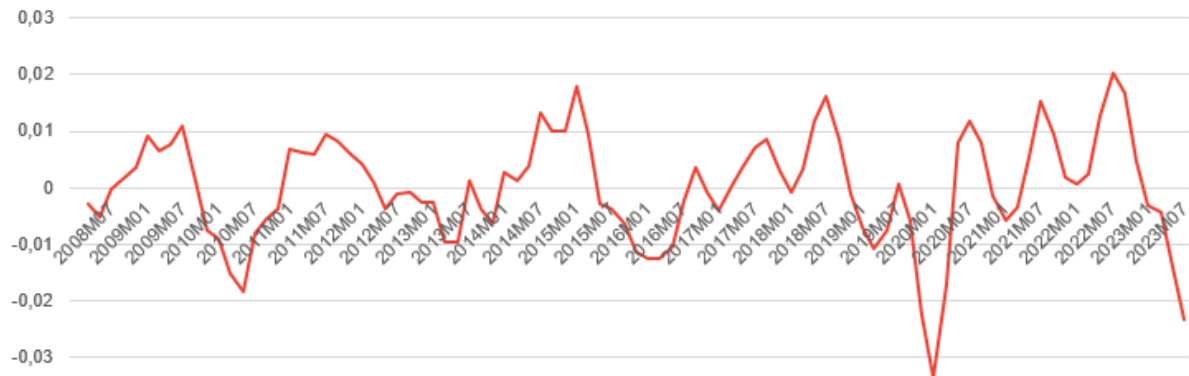
6.2.4 Money supply

According to Minsky, money supply and a stable and rapid increase of such is a potential factor for fuelling the shift from healthy hedge finance to more questionable speculative- or even Ponzi finance (Grytten & Hunnes, 2016). According to Minsky's theory on financial three-step taxonomy, such an inflated money supply might lead to a continuous increase in financial markets, even after the boom in the economy in general gradually wanes.

Analysis of M2

To investigate the money supply, we applied an HP filter with lambda equal to 1600. We use monthly data, reaching back to 2008. For all analyses of money supply, we have investigated M2, encompassing currency and coins held by the public, checkable deposits and saving deposits (SSB, 2023k). The following are our cyclical deviations, smoothed by a five-period smoothing parameter.

Figure 9: Cyclical Deviation in Growth in Money Supply (SSB, 2023i)

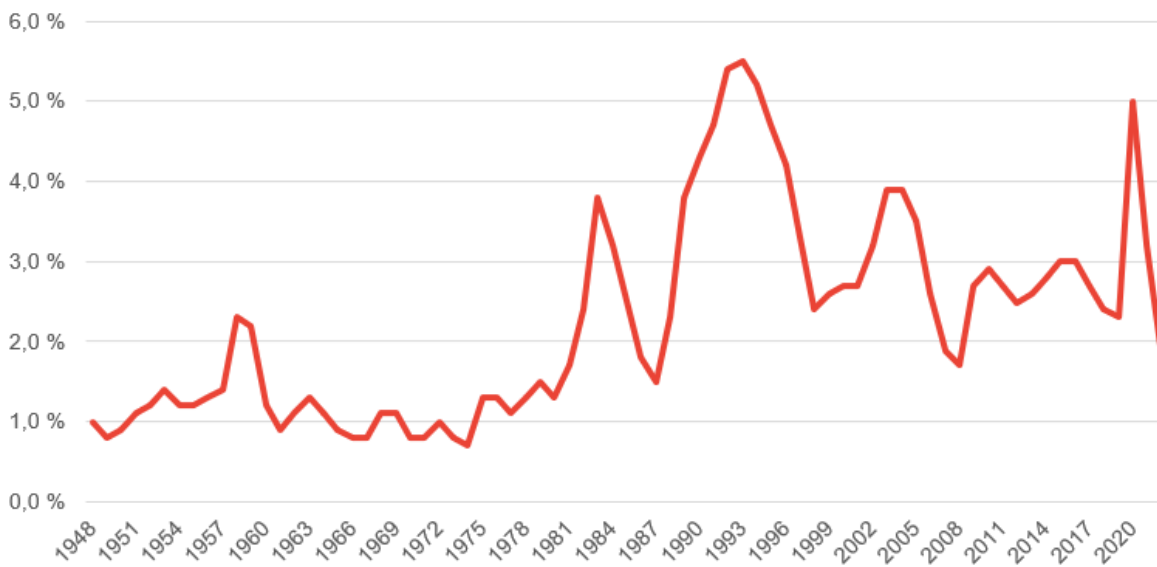


Looking at the cyclical deviations, we find that the money supply turned from declining below trend to increasing when the COVID-19 pandemic broke out somewhere around March 2020 and thereafter grew above trend from June 2020. The growth in money supply afterwards was above trend until the first quarter of 2023. The first two quarters of 2023 have seen an increase in money supply below trend, but nine out of eleven quarters saw growth above trend prior to 2023.

Unemployment

Unemployment typically lowers in times of strong economic growth as the demand for labour increases. In times when economic growth is weaker, unemployment often grows. Unemployment could lead to path dependency, as increased unemployment leads to reduced purchasing power amongst the population and, therefore, lower economic growth (NHO, 2023).

Looking at the data from 1948 to 2022, we find that unemployment has increased, especially during crises, supporting the argument above. We see increased unemployment during the banking crisis, the financial crisis, and during the outbreak of COVID-19. In general, unemployment is not very high, and in Norway, it has stayed below five per cent in the last twenty years.

Figure 10: Annual Unemployment in percent (NAV, 2023c)

6.3 Interest Rate and Debt Analysis

6.3.1 The Taylor Rule

The Taylor rule is interesting, as it shows what interest rate the central bank should set based on various parameters, such as actual inflation, targeted inflation, the neutral interest rate and the production gap. It is important to note that the Norwegian Central Bank does not utilise the Taylor Rule when deciding the policy rate but rather emphasises various other factors, many of which are also incorporated in the Taylor Rule.

The analysis is important to our problem, as it gives an indication of whether the monetary policy contributed to the creation of financial instability and a higher growth rate than the actual long-term trend suggests. Thus, leading to gradual overheating of the economy.

Analysis

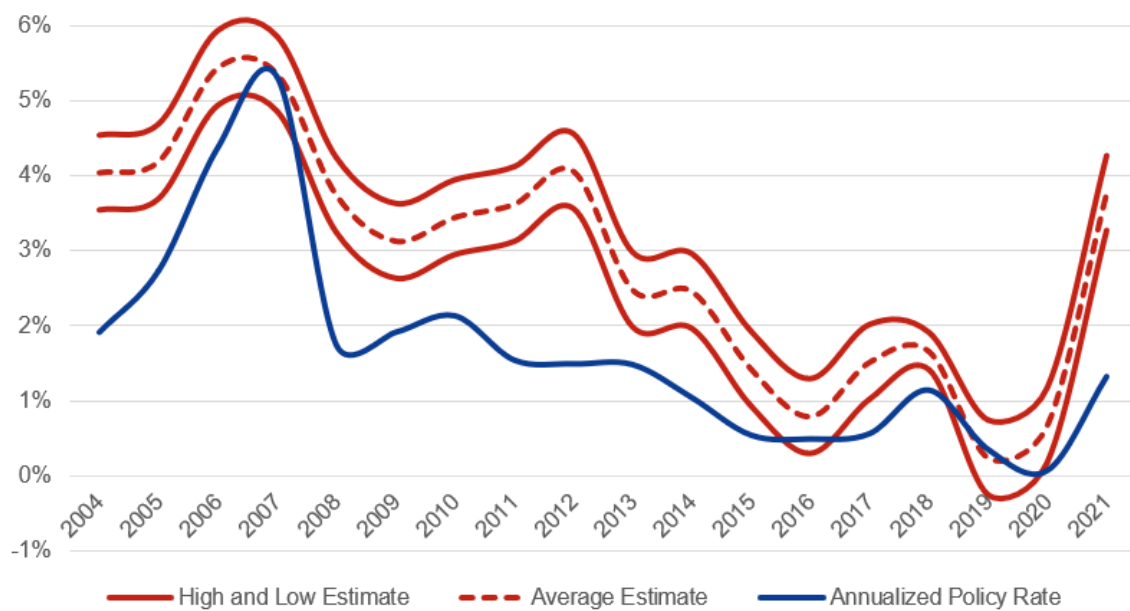
The methodology and theory behind the Taylor rule are explained in chapter 3.1. We have applied the following formula for the analysis.

$$i_t = \pi_t + r_t^* + \alpha_\pi(\pi_t - \pi_t^*) + \alpha_y(y_t - y_t^*) \quad (3.1)$$

The findings were compared with the actual annualised policy rate. To look at the policy rate over time, we have decided to look at annualised data from 2004 to 2022, with 2004 being the first year we could find reasonable estimations of the neutral interest rate.

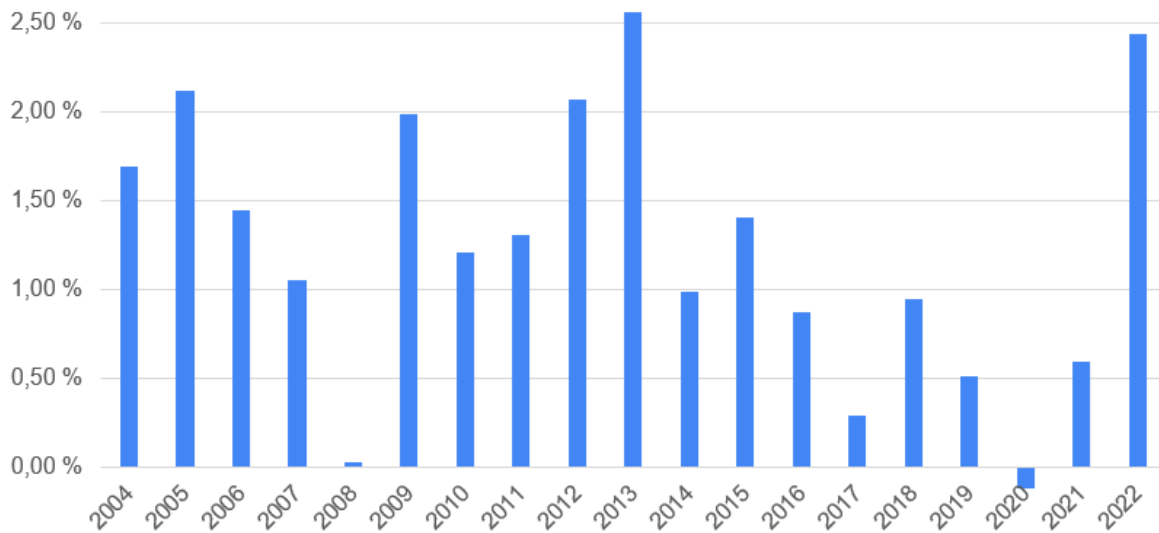
There are still major uncertainties in the factors going into the calculations of the Taylor rule, such as the accuracy of the neutral interest rate. We have used both a high and low estimate to counter potential uncertainties, ensuring a more comprehensive estimate of the calculated Taylor rule. For inflation, we use core inflation, CPI-ATE, as this has less variation and is a better base for determining policy rates, which is meant for long-term stability. Annualised policy rates and the results from the Taylor rule are visible in the chart below.

Figure 11: Taylor Rule and Central Interest Rate
(Norges Bank, 2023ba; Norges Bank, 2023d; Norges Bank, 2017; Norges Bank, 2010; Norges Bank, 2008; Norges Bank, 2006; Norges Bank, 2004)



Our model shows a clear tendency since 2004 that the policy rate has been set too low compared to the Taylor rule. Except for 2008, 2017 and 2020, the policy rate is reliably lower than the estimates of the Taylor rule. In 2022, the real policy rate had one of the greatest deviations from the calculated policy rate observed.

Figure 12: Deviation Between Central Interest Rate and the Taylor Rule Average (Norges Bank, 2023ba; Norges Bank, 2017; Norges Bank, 2010; Norges Bank, 2008; Norges Bank, 2006; Norges Bank, 2004; SSB, 2023e)



In the figure above, we visualised the difference between the Norges Bank interest rate and the results of the Taylor rule. It becomes evident that the interest rate, according to the Taylor rule, has been constantly set too low and might have contributed to overheating the economy.

6.3.2 Debt and Interest Rates

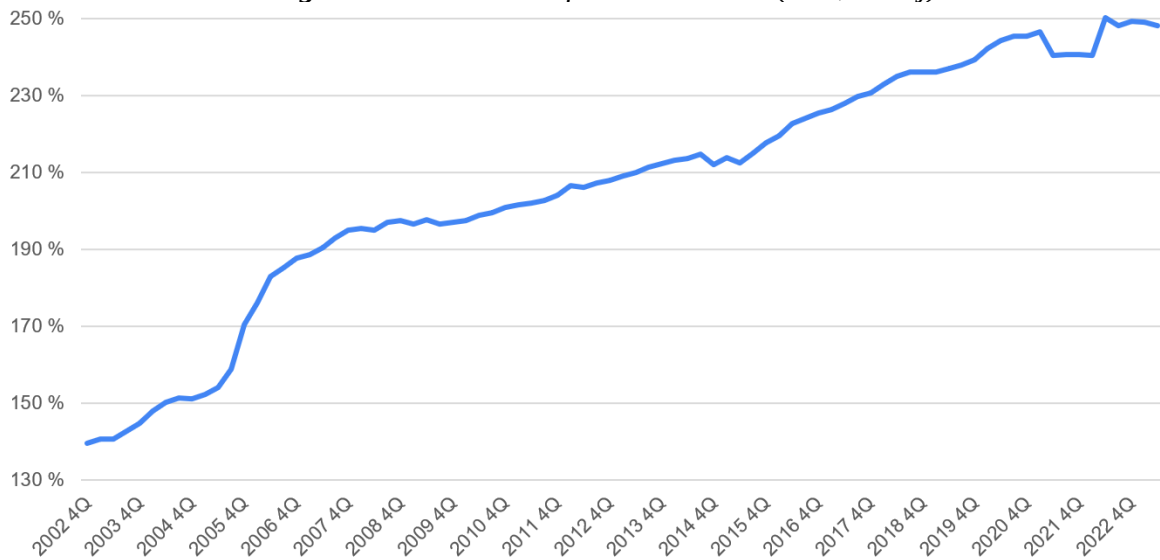
A major part of financial stability is the ability of the economy to absorb economic shocks. For households, the amount of debt, debt to disposable income, and how much disposable income goes to paying down debt are essential factors for their ability to stand firm in financial turbulent times (Hayes, 2023). How much debt households can take on is dependent on a variety of factors, such as interest rates and financial regulations. Economies with low and stable inflation and associated low, stable interest rates might, therefore, experience a gradual increase in the household debt ratio if not otherwise regulated. The importance of debt ratios has been investigated by Hansen and Throsetein (2016), and it was found that the following recession after a crack was substantially more profound and longer than the recession in economies with lower debt ratios amongst their households (Reinhart & Rogoff, 2009).

Analysis of household debt to income

By dividing average household debt by average household income, we arrive at the indicator of household debt to income. Plotting this time series from 2003 until the second quarter of

2023 shows that the household income-to-debt ratio has skyrocketed in the last two decades. From 2002 till the second quarter of 2023, the ratio has increased from about 140 to about 250 percent. This means that households have had an average, relative increase of three quarters.

Figure 13: Debt to Disposable Income (SSB, 2023j)



Interest rates

Interest rates are important to the stability of the system because they affect how much it is for both private businesses and households to lend for consumption or investments. When interest rates are meagre, and money is *cheap*, both businesses and households are prone to increase their debt ratios, as the required return to cover interest expenses is very low. The central bank sets the central interest rates with many considerations in mind, perhaps most importantly is stable inflation.

Real interest rates

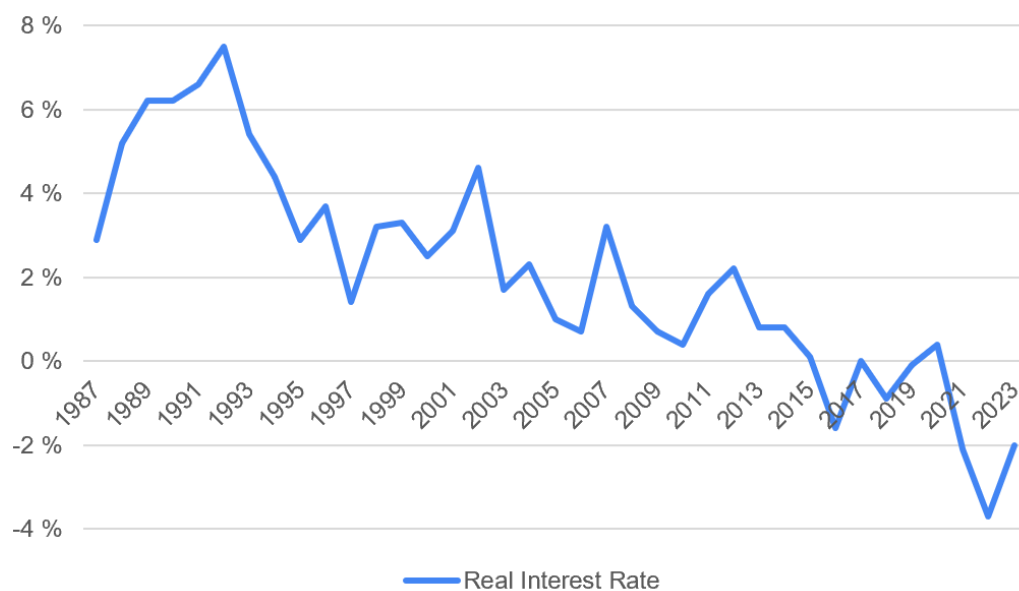
Real interest rates show us how profitable it is to borrow money. It is found by deducting tax incentives and inflation from interest payments. The formula for the real interest is given by the equation:

$$\text{Real Interest Rate} = \text{Nominal Rate of Interest} - \text{Inflation Rate} - \text{Tax Benefit}$$

(6.14)

Negative real interest rates indicate that it is, in theory, profitable to borrow money. When looking at the developments in real interest rates, it is interesting to see the stable downward-sloping trend since the end of the 1980s. From there being positive real interest rates consistently between 1987 and 2015, we now find that there have been negative real interest rates for most of the time between 2016 and 2023. Such developments are perhaps essential driving factors for increasing leverage for businesses and private consumers and can contribute to overheating.

Figure 14: Real Interest Rates on Mortgages (Pedersen, 2023)



Splitting the time series into periods before and after 2015, there is a clear difference between real interest rates historically and for the recent years. From a consistently positive real interest rate average between 1987 and 2015, there has mostly been negative real interest rates, with some exceptions since.

Table 6: Debt to Income Ratio Amongst Households in percent (SSB, 2023j)

Period	Debt to Income Ratio in percent
2002	140.8
2023	248.3

Average annual relative Increase	3.0
----------------------------------	-----

From table six, we find that when looking at the increased leverage amongst private households, there has been an almost continuous increase in the debt-to-income ratio for private households. Coinciding the lower real interest rates with increased leverage among households support the notion of reduced financial stability.

6.4 Analysis of the Oslo Stock Exchange

6.4.1 Tobin's Q

As explained in Chapter 2.2, Tobin's Q estimates how the market prices of aggregated markets or singular companies are compared to the reacquisition cost of their assets. It indicates how market values have developed compared to a measurement of fundamental asset values. It is, therefore, highly relevant to our problem and whether the Norwegian economy has experienced overexpansion and overheating during the last two decades.

Analysis of Tobin's Q

We decided on using the simplified Tobin's Q on aggregated data from Bloomberg. The data we use are monthly aggregated prices, representing the market value of the OSEBX, as well as paired aggregated book values from 1996 to November 2023. We have graphed the basic simplified Tobin's Q and the logarithmic value to see both the Q value and the relative growth. By monthly calculations, we graphed out the results, visible in the graph below.

Figure 15: Simplified Tobin's Q 2001 to 2023 (Bloomberg, 2023)



Figure 15 shows a clear upwards sloping trend since the end of the financial crisis in 2008 to-date. Between 2001 and 2003, the value stayed relatively modest. After 2003, it is apparent that the market valuation started increasing rapidly, and it reached above two and a half times its standard value in March 2006. From March 2006 until December 2007, the ratio stayed high, before it plummeted to nearly one at the end of 2008. The decades after the financial crisis have in total seen slow and steady growth, with cyclical setbacks, to the levels we see today.

More recently, the decrease due to the outbreak of the COVID-19 pandemic is visible, with rapidly increasing values until it hits a local extreme point. During 2022 and 2023, it has slightly decreased, but as of November 2023, it is still high compared to the post financial crisis average. The table below shows periodic averages:

Table 7: Average Tobin's Q For Selected Time Periods (Bloomberg, 2023)

Period	Simplified Tobin's Q
Avg. Oct. 2001- Oct. 2005	1.47
Avg. Nov. 2006- Oct. 2008	2.51
Avg. Nov. 2008- Oct. 2023	1.59
November 2023	1.76

Isolated, the present-day Tobin's Q insinuates that the aggregated market is overpriced. The market is in perfect equilibrium when the reacquisition costs of all assets are equal to the market value. The constant, and far above one, values witnessed in the analysis might be a testament to the simplified nature of our analysis. We ignore several important factors by using book values of equity as representations of the reacquisition cost of assets. The fact that Tobin's Q is above one is therefore not proof that it is overpriced. Still, the relatively stable increase from one in 2008 to 1.75 in 2023 is a clear sign of relatively higher valuations over time at the Norwegian stock exchange. These are essential indicators for further discussion on overheating.

6.4.2 Oslo Børs Benchmark Index

The OSEBX is the main index for Norwegian publicly traded companies. According to Minsky, in times of monetary expansion, stock exchanges might experience booms due to more money being available for speculative or Ponzi investments. Typically, investors will gradually realise assets are overpriced, and the markets will enter states of nervousness with a clear reaction to all types of information. As crashes in financial markets have proven historically to sometimes have a contagion effect on other parts of the economy, such as the great depression during the 1930s, the banking crisis during the late 1980s and its contribution to leading Europe into the euro crisis of the 2010s, it is highly relevant for cracks in the overall economy as well. It is, however, essential to note that a crack in financial markets does not necessarily lead to a crack in the overall economy. A good example of this is how the Norwegian economy absorbed the effects of the financial crisis of 2008, even though we also experienced a crash in the stock market.

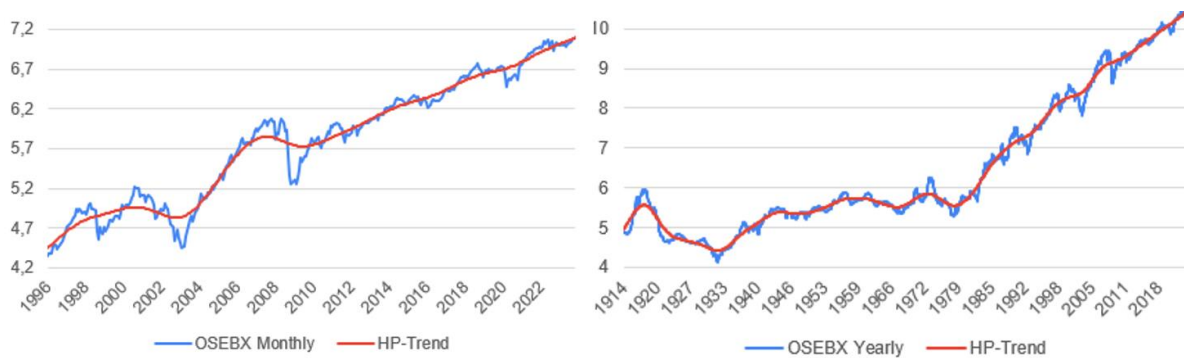
Analysis of OSEBX

We utilised indexed monthly data on OSEBX, concinnated between three different datasets, to get values reaching back to 1914. The datasets were merged by finding reasonable ratios based on overlapping data and using those to prolong the most recent dataset back in time.

For the analysis, we opted for an HP filter, using Lambda equal to 14'400 for monthly values, and 144'000 for yearly. It is immediately apparent that the stock index is far more volatile than the other financial measurements we have investigated. Booms and busts are far more common

in the stock market than, for example, in the GDP, housing prices, etc., where deviations are often less drastic (Clardie, 2023).

Figure 16: Monthly and Yearly Trends in the Stock Market (Bloomberg, 2023; Eithreim et al., 2004)



When looking at the time series unprocessed by filters or regression analysis, another aspect relevant to our problem becomes visible. The total growth in the stock markets seems to have been very low in the last six quarters, with next to no total growth. This might be a sign that the markets are unsure of how to react to current world events and might be a sign of nervous markets.

6.5 Minsky Moment Analysis

Having investigated each factor individually, it is now interesting to examine them in a broader coherent context, looking specifically at when long-term trends tend to shift. It will be especially interesting to investigate when the trend goes from growth to degrowth since this can indicate when the economy's psychology has gone from positive to negative; hence, this will indicate when the *Minsky moment* occurred. The Minsky Moment, as first formulated by Minsky, is also a significant part of Grytten- and Hunnes seven step dynamic crisis model, as it marks the psychological switch in the population and the beginning of the downturn in the economy that might lead to crack and or crisis.

Minsky Moment

When conducting the *Minsky Moment* analysis, we look for extremal points of the HP-trend, as well as when and where the growth subsides or increases through the first and second derivative; we have chosen a conservative approach to the use of lambda, giving more credit to

the trend itself, and less to cycles. This is because higher Lambda values are helpful when determining cycles and deviations from such but are too all-encompassing when we want to determine fluctuations and nervousness in the market. Thus, we have chosen 50 as the lambda value for the annualized data in the *Minsky Moment* analysis.

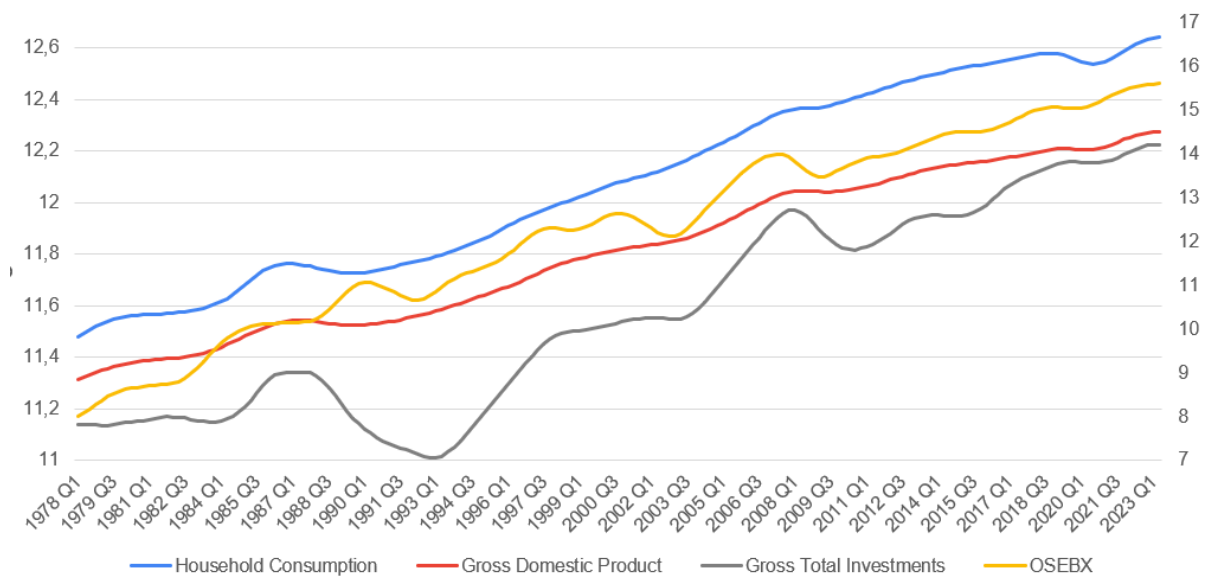
Consumption, Investment, GDP and OSEBX

From the table below, the HP trends' simple and double derivative shifts seem to coincide with household consumption, investment, and GDP for many of the crises in question. Due to the rapid development of the HP trend for OSEBX, the trend uses the axes to the right to indicate its values.

Banking crisis from '1970 to 1980'

When looking at the banking crisis of the late 1980s and early 1990s, we find an initial negative turning point in the first quarter of 1987. This turning point of the derivatives indicates that the *Minsky Moment*, and therefore the nervousness phase for the banking crises of the 1980s, occurred in the first quarter of 1987.

Figure 17: Minsky Moment Analysis Consumption, Investments, GDP and OSEBX (Bloomberg, 2023; Eithreim et al., 2004; SSB, 2023h)



Financial crisis 2008

It is observable that the next negative turning point took place during the year 2008, but in contrast to the banking crisis, the trends did not shift simultaneously. The turning point for

OSEBX and GDP was in the first quarter of 2008. In the last quarter of 2008, one observed the extremal moment in investments. Even though the double derivative of household consumption is negative, the derivative of household consumption never became zero. Thus, household consumption never reached a turning point during the financial crisis. However, the derivative of household consumption is getting close to zero, with its closest being in the last quarter of 2008.

Contrary to the banking crisis, the HP trends of household consumption, investment, GDP and OSEBX did not reach a turning point in the same quarter. This could indicate that the financial crisis took longer to affect other parts of the economy.

COVID-19 Pandemic

The last major extreme points we will comment on occur in 2020. Investment, GDP, and OSEBX reached a negative turning point during the first quarter of 2020. This happened during the outbreak of Covid-19 in February and March 2020. The trend in household consumption has a turning point in the third quarter of 2019. This can be explained by the relatively extreme restrictions on the ability of households to consume from the first quarter of 2020, affecting the HP trend substantially. From 2020 onwards, we see a flatter trend, with almost zero differential for all four trends.

6.6 Shortcomings of the analysis

There are some challenges with the implementation of our analysis. The HP-filter faces difficulties in identifying deviations from the trend because it considers the high growth rate as normal behaviour, making sustained high growth rates appear normal over time and become the trend. Hence it will be more difficult for the HP-filter to spot bubbles in the real estate market.

We face limitations in the debt-to-income ratio as our data only extends back to 2002. A more robust analysis could have been achieved if we had examined the ratio over a longer historical period, thus enabling a comparison of today's ratio with earlier crises. Additionally, it would also be insightful to include real-interest rates that date longer back than 1987 since the real interest rate has been much higher and lower prior to our dataset.

7. Discussion

In the following, we discuss the analysis considering relevant theory and historical happenings to answer the research question: Is the Norwegian economy heading into a crisis? This will be done by first discussing the current and recent economic and financial situation in relation to the seven-step dynamic crisis model. Then, we will do a more comparative analysis of three major crises to understand further what has happened in similar situations or how the current situation differs.

7.1 Road to crisis – the Economy and the Seven-Step Crisis Model

Every crisis is different, but often has some similar development patterns. In the following, we will use the seven-step dynamic crisis model as a framework for discussing the course and developments of the economy to gain further insight into the current situation.

7.1.1 Disturbance and loss of financial stability

When discussing the potential displacement to the economy, which leads to financial instability, it will be useful to have both a short- and long-term view. This is due to our investigation of both short-term bubbles and general long-term overheating.

Sudden incidents as potential disturbances

In the last couple of years, there have been different incidents that could be the reason for displacement. Firstly, the world experienced an international pandemic, the coronavirus outbreak. The pandemic led to the implementation of restrictions and measures that limited the supply and demand of many goods, especially service-related sectors (Vidovic, 2022).

Another potential exogenous displacement is the outbreak of the war in Ukraine. The war has led to an energy crisis in Europe, with Russia trying to punish European nations for siding with Ukraine. The increase in energy prices has affected Europe significantly, and as a small, open economy, Norway as well (Lier & Bach, 2023). A lot of the effects on the Norwegian economy have been through an increase in input factor prices.

Another possible disturbance is the introduction of artificial intelligence, potentially affecting several industries and sectors substantially, increasing the expectations for future growth, and changing the landscape.

These are just examples of incidents that have the potential to disrupt the Norwegian economy and kick-start the creation of financial instability. Just one of these incidents could be enough in and of itself but seeing them all coincide can lead to unforeseen consequences.

Gradual loss of stability

Some gradual external disturbances that might function as disturbances to the Norwegian economy might be the euro crisis of the 2010s, the aftermath of which European states are still grappling with. (Grytten & Hunnes, 2016) Several important trade partners to Norway have experienced high debt accumulation and loss of financial stability. Furthermore, the Euro crisis has potentially led to lower policy rates across the eurozone, making it natural for Norway to lower its rates to keep a currency stable with our main trading partners.

It is worth mentioning that according to Grytten and Hunnes, not all steps in the seven-step dynamic model must be fulfilled. Therefore, it is possible that the potential overheating of the Norwegian economy has occurred slowly but steadily, gradually, without any single disturbance that can explain the cause of overheating. In such a case, all the disturbances described above are potential contributors, but none is necessarily the only disturbance.

7.1.2 Overheating

This part will discuss signs and factors indicating if the Norwegian economy has been overheated. We will investigate which factors could have contributed to the overheating and in which period they had the most noticeable effect.

A misguided hegemony power in a small open economy

From our analysis of the Taylor Rule in Chapter 5.8, Norges Bank chose a policy rate that has consistently been set too low between 2009 and today, given the level of GDP and inflation in the Norwegian economy. Furthermore, it is clear from the analysis of the interest rate in chapter 5.4 that even though the average real interest on mortgages has been two percent from 1987 to 2023, it has had a negative average as low as -1.25 percent between 2016 and 2023.

The analyses in 5.8 and 5.4 indicate that the policy rate has consistently been set too low over an extended period. When the central interest rate falls below the market equilibrium, it incentivises the market players to become more leveraged and has the potential to lead to overexpansion.

Household Debt

Historically, the most common way Norwegian households have invested money has been by investing in real estate (SSB, 2019). Hence, it is interesting that the average real interest rate on mortgages has been below or near zero since 2015 since it indicates that most Norwegian households, in theory, have profited from mortgage loans. This has led to strong incentives for households to leverage up. This would increase the credit volume and could contribute to the economy's overheating.

Furthermore, as shown in the analysis, household debt has increased rapidly over the last 20 years, and the debt-to-income ratio has had a total relative growth of 77 percent. Likely, the shift to negative real interest rates on mortgages in 2016 gave Norwegian households incentives to become more leveraged.

As explained in Chapter 2.3, an economy needs a well-functioning hegemony power to avoid overheating and falling into a phase of financial instability creation. Both the analysis of the Taylor rule and leverage among private households indicate that the central bank has consistently decided a policy rate below the market equilibrium, giving the Norwegian households strong incentives to become more leveraged, which could lead to gradual overheating of the economy. Thus, we believe that the hegemony powers of the Norwegian economy have not acted ideally to keep the economy financially stable over the last two decades.

A loss of correlation

In chapter 5.3, we analysed GDP, private consumption, and gross total investment and found them to be mostly closely correlated. However, during the five years from 2012 to 2017, the pattern changed. While gross domestic investments went well below its trend, GDP and private consumption did not and kept close to and above the long-term trend.

According to historical trends, when gross domestic investments decline, GDP should do the same. Also, low activity in gross domestic investment is an indicator of companies and industries being uncertain or pessimistic about future economic prospects (Dimpfl & Kleinman, 2019). Hence, a loss of correlation between cyclical consumption and investments is of high importance.

The continued high private consumption can explain why GDP experienced a positive deviation from its trend. Private consumption experienced its most extended positive deviation from the trend in over 20 years. Hence, the growth is probably consumer driven. The economic growth was strengthened by continued growth above the trend of private consumption, which, in turn, compensated for low gross domestic investments. This could be attributed to the consumer's more short-term horizon in the economy, in contrast to the investors. It is also worth mentioning that the Norwegian economy is highly export oriented (Rolsdorph, 2021); thus, a strong demand from other countries would help to keep the GDP above trend, even if the investments are low. With GDP and private consumption in a boom, a lack of investments might pose a risk to future economic expansion and productivity and should perhaps be investigated further.

Monetary Expansion

Empirically, monetary expansion is a major driver when economies become overheated (Grytten & Hunnes, 2016). The central bank's policy rate often affects the demand for credit but is not the only factor. From the analysis in chapter 6.5, we observed that there has usually been monetary expansion ahead of historical crises. Examples are the First World War, the bank crisis of 1987, and the financial crisis of 2008.

Neither our short-term monthly analysis nor our long-term yearly analysis shows any sign of positive deviation in the money supply between 2010 and 2020. This indicates that the economy might not have experienced overheating during this period, as suggested in the previous chapter.

Nevertheless, following the outbreak of the COVID-19 pandemic and the expansive fiscal and monetary policies put in place, there was a substantial increase in the money supply. Simultaneously, as M2 increased, asset prices such as housing prices, stock indexes, and GDP experienced tremendous, rapid growth, which would all be alarming signs of overheating and short-term bubbles.

7.1.3 Bubble Economy

This chapter will discuss the possibility of bubble tendencies in the Norwegian economy.

Money Surplus

After the outbreak of the COVID-19 virus in 2020, Norwegian politicians sought to prevent the economy from cracks and crises. They implemented economic stimulus packages for businesses and individuals to maintain financial stability. These packages also became larger than initially planned by the government, driven by pressure from the political opposition (Grytten, 2022c). As observed in the analysis in chapter 5.5, all these stimulus packages injected into the Norwegian economy increased the growth in the money supply from the second quarter of 2020. They stayed above the long-term trend until the first quarter of 2023.

However, at the same time as the Norwegian government delivered stimulus packages abundantly to the economy; a large part of the service economy had to be temporarily closed due to the restrictions imposed by the government (Grytten, 2022c). The result was fewer options for consumers to spend money on; thus, their private consumption dropped. As we observed in chapter 6.3, private consumption had its most significant drop beneath the trend in 2020. The stimulus packages increased consumers' money without giving them many options to spend it on besides asset investments. Hence, Norwegian consumers now found themselves in a scenario where they had a higher money surplus but fewer options to spend it on.

Historically, asset values have increased when markets have gotten rapid access to more money (Grytten & Hunnes, 2016). During the COVID-19 pandemic, we saw the same pattern. From our analysis, the large cash surplus consumers hoarded during the pandemic seems to have been invested into assets such as stocks and real estate during the first months. It is unlikely that fundamental values across the stock exchange increased at this time due to shutdowns of the society, but stock prices still rose significantly after the initial crack. These unfounded increases in asset prices are clear signs of potential asset bubbles, which we will look further into.

Do we have a housing bubble?

At the same time as Norwegian households had fewer options for what they could invest their money in, *Norges Bank* decided to lower the policy rate from 1.5 percent in March 2020 to zero per cent in two months. The policy rate stayed at zero percent over a year until September 2021.

Even though it was no longer zero, the interest rate stayed low until 2022. Partly due to the low interest rates, the real interest rates were kept at the low levels seen before the pandemic in our analysis and were eventually reduced even further. The real interest rate on mortgages is close to zero in 2020; while it turned negative in 2021 before it plummeted to -3.7 percent in 2022.

The low and negative real interest rate on mortgages from 2020 to 2022 gave the market a tempting incentive to invest in real estate since investors and private consumers, in practice, had negative interest rates on their loans. In addition, the nominal interest rate was low, meaning the need for strong monthly cash flows was lessened. Thus, Norwegian households experienced strong incentives to invest in assets during this period. The consumers had more available cash, primarily due to maintained salaries and fewer options for consumption, while there were negative real interest rates.

The consequences of the two strong incentives seemed to flourish shortly after the coronavirus outbreak. As money became more easily available and it became more profitable to take out loans, the real estate market seemed to get renewed growth. Seeing the constant growth in the real estate market over the last twenty years might also have contributed to more speculative investments, with people expecting prices to continue going up because they have done so in the past. Once people observed that the growth in the real estate market was highly profitable, it could be that more people decided to place their investments in this market in hopes of future returns. Resulting in a housing market with many similarities to markets affected by speculative finance.

The analysis in chapter 6.1 shows that housing prices sharply increased in the third quarter of 2020. The HP-filter shows that housing prices have a clear positive deviation from its trend from the first quarter of 2021 until the end of 2022. According to the analysis, this could argue that there has been a momentary real-estate bubble from the start of the corona pandemic to 2022. Hence, it is not unlikely that the growth in real estate was driven by speculation and lacked a real economic foundation, leading to a euphoric bubble in the real estate market. However, seeing an increase in money supply and that people seem to have had to spend more time indoors, it is not unlikely that the bubble tendencies are non-euphoric and can be explained by fundamental factors in the market.

The deviation from the long-term trend during corona was not very substantial. This might indicate that the bubble was small. However, as the real estate market has grown enormously over the last twenty years, it could be harder to spot deviations from the true long-term trend if there have been overheating and bubble tendencies for a long time. This could make it more challenging to observe the bubble since the trends assume historic growth would continue, making abnormal values seem more normal. This makes it harder to spot the bubble with an HP-filter.

It could be that the combination of favourable loans and rising house prices may have led to speculative and Ponzi finance scenarios, where people anticipate continuous price increases and seek to capitalise on this growth so as not to be left behind when prices continue to skyrocket. Consequently, consumers have taken on loans with the expectation of selling at a profit, as a belief that the housing market will continue to rise persists, irrespective of the development of the fundamental values.

Since the autumn of 2022, the increase in housing prices has stopped. The halt in development could originate from the market participants realising housing prices had risen more during the pandemic than the fundamental conditions would suggest, thus making market players nervous if the prices drop to pre-corona levels. This aspect will be further examined in the upcoming chapter. Another likely cause for the halt in price is the more restrictive monetary policies, with policy rates increasing.

Long-term bubbles in the housing market

From our analysis in 6.1, we observed that housing prices had developed tremendously since the 1960s. Besides the crack in real estate prices after the banking crisis, housing prices have skyrocketed, and real-estate prices have deflated, with GDP per capita increasing more than ten times over the last 50 years. Seeing this enormous price growth, it is hard not to question its accuracy and long-term growth rate.

Based on our HP filter analysis, it is not immediately clear that there is a long-term growing bubble in the Norwegian real estate market without using far too extreme lambda values. However, based on the extreme growth of real estate prices in the last decades, the trend will assume this growth is normal, thus making it harder for the HP-filter to spot a potential bubble.

Even though the HP-filter analysis, with a normal Lambda value, does not indicate a bubble, it is hard to argue that a tenfold growth in deflated values is reasonable.

There are still a lot of factors that speak in favour of the housing prices going up over the last six decades. Generally, the housing quality in terms of isolation and materials is much better than before (Melkild Avset, 2018). Furthermore, the population has grown more than the number of houses, which makes the demand for housing even higher. It is also apparent that prices for materials and labour have increased, as well as substantial immigration and urbanisation (SSB, 2023l; SSB, 2023m).

We observe that the housing market has had tremendous growth over the last decades, which can indicate that there is a long-term bubble. It is hard to say if the potential bubble is euphoric or non-euphoric. However, we can explain much of the growth by fundamental reasons, thereby indicating a non-euphoric bubble, or perhaps not a bubble at all.

Summing up the possibilities of housing bubbles, we find many indicators from chapter two are present. Important among these indicators are increased leverage among households, high prices compared to historical averages, rapidly increasing prices and some foundation for why the prices have increased as they have.

Bubbles in the stock market

In the years following the financial crisis of 2008, the Oslo stock exchange has experienced solid growth. The index grew to 155 percent from January 2010 until December 2019. The analysis of fundamental values showed that Tobin's Q has increased significantly from the end of the financial crisis to the present day, with a steady upward-sloping long-term trend.

When the COVID-19 pandemic hit the Norwegian economy, and consumers experienced an abundance of money compared to the opportunities to use them, the stock market seemed to experience a surge after a short slump. The money pumped into the stock market made the prices rise to 81.7 percent from the bust at the beginning of Corona to its highest point. Comparing February 2020, before the bust following the outbreak of Corona, to May 2021, we found an increase of 56.7 percent. While GDP fell, and there were global logistic issues, with oil and gas prices plummeting, the Oslo Stock Exchange still experienced dramatic growth.

In tandem with the long-term upswing in the stock market, Tobin's Q has experienced growth. While the average value of 2008 until the beginning of 2020 was 1.5 percent, it peaked from July 2021 until February 2022 with a value of 2.2 percent. This rapid increase in Tobin's Q could be attributed to the possibility of stock prices increasing more than the fundamental values suggest, which could indicate that the Oslo Stock Exchange was in a bubble state.

The Oslo Stock Exchange eventually became saturated as the prices began to level off, and Tobin's Q decreased. However, the rapid increase in OSEBX without a clear corresponding increase in fundamental value indicates a short-term bubble during corona. The value of Tobin's Q has fallen from its peak in the autumn of 2021. However, it is still at a high value of 1.76 percent, far above the average from after the financial crisis and today, arguing that there might also be a long-term bubble after gradual overheating in the stock market.

The rapid increase of the values on OSEBX, with the corresponding increasing Tobin's Q, suggests the stock market has risen above its fundamental values and that there is a long-term bubble in the stock market. There is still the possibility that the increase is reflected in the fundamental values in ways not picked up by our analysis. Examples of such are increased oil- and gas prices leading to higher expected returns offshore and special cases of valuation within main industries, such as seafood and shipping.

7.1.4 Nervousness

As previously discussed, the real estate market has experienced high growth in the last decades and faced a boom during the pandemic, probably due to a monetary surplus. Nonetheless, the coronavirus restrictions were eventually lifted, and most of the economy could again do business as usual. Not long after the restrictions were lifted, *Norges Bank* decided to increase the policy rate, most importantly because of the threat of increasing inflation (Norges Bank, 2022b). Between the beginning of 2022 and October 2023, the policy rate has increased rapidly, from 0.5 to 4.25 percent. This sudden increase has led to more expensive house mortgages and less available credit for businesses, representing a stricter shift in monetary policy.

Most borrowers seem to handle the increased interest rates, but there have been challenges. It was reported by debt collection agencies that a increasing number of borrowers have payment

problems, even though real interest rates are negative (Nysteen, 2023). The reason for this might be higher interest payments in the short-term view, affecting cash flows significantly.

Inflation has reached record highs, above what we have seen since the turn of the century, contributing to negative mortgage real interest rates despite rapidly growing interest rates.

The increase in interest rates leads to fewer people being able to afford and prioritising home purchases, thus shrinking the demand for housing and the turnover in the housing market (Skipperø, 2023). This has contributed to the cooling of the strong growth in real estate prices and is a sign of more nervousness in the housing market.

The small downturn for real estate prices in 2022 only lasted for two quarters before they began to rise in the first quarter of 2023, before continuing a below-long-term trend growth in the second and third quarters of 2023. These volatile price fluctuations could indicate that the real estate market is experiencing nervousness, with high reactions to signals and information.

A faltering hegemonial power

According to Kindleberger, it is wise for hegemonial powers to stimulate the economy during economic busts. However, in times of nervousness, the stimulus could potentially contribute to prolonging the bubble or even growing it further. 77 percent of the Norwegian population owns their own home, and most have taken on debt to do so (SSB, 2017; Amundsen, 2017). It is, therefore, logical that Norwegian politicians do not want a crack in the housing market, as people, in that case, would see what they view as their savings in the form of homes losing value.

In the fall of 2022, the Norwegian government changed the lending regulations. They lowered the so-called *stress test*. Loan applicants used to have to be able to handle a five per cent increase in interest rates but are now only required to handle the cash-flow effect of a three per cent increase (Lier & Lea, 2022). This change was made against the recommendations of the financial supervisory authority, which argued that it would work countercyclically and lead to higher debts than necessary.

Private banks were pleased, as they could now lend more money to more people. The new policy from the Norwegian government would make more credit available for the housing market, which could sustain or even push the prices in times of nervosity. Hence, the

government did what is typical for a hegemonic power to do in times of nervousness and seems to have acted countercyclically. If there truly is a housing bubble, these new regulations posed by the hegemony power have the potential to make it even bigger.

Looking at other potential countercyclical measures from hegemony power, we find that the government has increased spending and the use of oil money in the revised national budget of 2024, further contributing to potential overheating (Tjoflot et al., 2023). With one hegemonial power increasing policy rates to combat inflation, it seems counterproductive to have another hegemony power increase national spending.

OSEBX

After rapid growth in the stock market, the index has not experienced any significant growth between the summer of 2022 and December 2023. There have been fluctuations but no crack or significantly increased growth. The fact that the OSEBX has not seen any overall growth in the past one and a half years, following a period of significant growth, may suggest nervousness in the market. People might be hesitant to invest further, as uncertainty connected with global collaboration, trade, and logistics seems to hang in the balance.

7.1.5 Turning Point

The turning point, the Minsky moment, in the economy, often occurs after a period of uncertainty in the market. As discussed in the previous chapter, there seems to be a period of nervousness in the economy, making it interesting to discuss how and when a potential Minsky moment might occur.

The Minsky moment is tied up to the psychological expectations people have. From the Minsky moment analysis in chapter 6, we see that the double derivative in GDP development, Gross domestic investment, private consumption and OSEBX has become negative, but the derivative is still positive. This indicates that the growth is steady but not decreasing substantially yet. Suppose the economic landscape continues to deteriorate, and the overall psychology in the economy shifts from nervousness to negativity. In that case, there is a possibility that the Norwegian economy will experience a crash in the already nervous markets.

Norway has a small and open economy. Thus, exogenous factors such as a further deterioration of global trade could be the incident that provokes a turning point in national psychology. There is a lot of uncertainty associated with estimating when the Minsky moment might occur. However, it is not inconceivable that it might happen in the not-too-distant future, given the market's nervousness over the past year.

7.1.6 Sum Up

There have been signs of short- and long-term overheating and bubble tendencies in various markets in the last few decades. It is worth noting that economic development has been weak since 2022, and inflation has risen drastically. Even though we have not seen a big increase in unemployment, there are signs that the next economic crisis might come in the form of stagflation, which will be discussed further in the next subchapter.

7.2 Historical perspective and discussion

Discussing historical similarities is useful, as it can give further understanding of the present-day situation and perhaps provide insight into how challenges we are facing now have been handled with success or failure by hegemony powers of the past. We have already touched upon the relevance of *jappetiden*, the banking crisis and the financial crisis of 2008, and we will now focus on discussing similarities between the present-day situation, and the stagflation of the 1970s.

7.2.1 Stagflation of the 70s

There are several similarities between the challenges the Norwegian economy faced during the stagflation of the 1970s and the present-day situation. In the following discussion, we will focus on similarities between the backdrop of the crisis, including external shocks and their effect, the economic situation in and of itself, and how the hegemony powers acted in the 1970s, exiting the economic slump.

A similar backdrop

As explained in Chapter 3.1, many economists before the stagflation of the 1970s believed they had solved the challenges with fluctuations in long-term growth. This was because of relatively

stable growth rates from after the war until the 1970s. Compared to today's situation, we see that GDP has had quite stable growth over the last 20 years, with only some exceptions, such as the financial crisis, the oil crisis, and the COVID-19 pandemic. The economists of the 1960s believed that they had found the solution to perpetual growth through a mixture of private incentives and a planned economy (Grytten, 2022a). In comparison, present-day economists often believe in perpetual growth, perhaps through global collaboration and stable monetary policy.

Before the stagflation in the 1970s, it was believed a long-term growth rate of four percent was not too unreasonable. Similarly, the Norwegian Department of Finance believes in a long-term growth rate of 1.75 percent in the present-day economy (KS, 2023). It is, therefore, tempting to draw similarities between the overly optimistic assumed growth trend in the 1960s and the current assumed growth trend.

OPEC I and OPEC II had a massive impact on the global economy, limiting the supply of vital input factors in the industries of Western industrialised countries. This functioned as an external shock and led to the economy reacting differently than the theory at the time proposed. Today, we find that the Ukrainian war and the European response, combined with supply shortages lagging from the COVID-19 pandemic, have led to supply-side issues like those that existed then. The price for oil and gas has sky-rocketed, leading to many of Norway's main trade partners having problems domestically (Kalstad, 2022).

Similar Occurrence

Stagflation is when there is increasing inflation, unemployment, and economic stagnation (Stoltz, 2022). As explained in 3.1, increasing inflation is often a sign of high temperature in the economy, and the economy is probably growing. In the 1970s, for the first time, economic growth halted at the same time as inflation and unemployment rose. Some of these effects are also visible in the present-day situation.

As shown in the analysis in Chapter 6, inflation has risen far above the targeted two per cent during 2023. This comes simultaneously as economic growth seems to have plateaued in the face of international challenges in which Norway has little sway. How much the GDP has decreased is hard to tell in real time due to issues with the measurement of real-time values, but many signs point to the fact that the economy is nearing subtraction. Examples are *Norges Bank*

and their report from November 2023, where they anticipate a contraction in the Norwegian economy in the first quarter of 2024 of 0.3 percent (Ipsos, 2023).

A major part of stagflation is the increased unemployment simultaneous with high inflation. Looking closer at the numbers on unemployment today, it has slightly risen between the summer of 2022 and the autumn of 2023, but it is still below the average for the last ten years. At 3.8 percent, it cannot be considered a major indicator that we are experiencing stagflation. However, it is important to note that unemployment has slightly increased, even in small increments, and that this, combined with inflation and decreased economic growth, is a sign of stagflation.

The road out of stagflation

Having established clear similarities between the stagflation crisis of the 1970s and the present-day situation, both in terms of backdrop, external events, and the temperature in the economy, it's interesting to see what measures hegemony powers took in the 1970s to exit the economic slump and discuss whether these measures are relevant for the economic situation in late 2023 as well.

The rise of the oil industry and the revenues it provided the Norwegian government in the 1970s was highly important. Through governmental control, oversight, and thorough taxation, the government secured increased revenues to the government budget and increased economic activity (Grytten & Hunnes, 2016). International investors took interest in Norway's growing oil sector, and increased economic activity ensued. Similarly, it is not unthinkable that there will be increased offshore activity, either because of an increased reliance on Norwegian oil and gas to the continent or due to the recently initiated seabed mining in the following years (Lier, 2023).

There is not necessarily a similarly clear industrial adventure ready to be launched to kickstart a new period of growth in the current economy, but the government has made several investments. There were high hopes for the battery production industry, visible through the rise and fall of *Freyr*, but as mentioned, we are still exploring and finding vast natural resources (Rustad & Lea, 2023).

When looking at political measures to counter the crisis, we see quite different ways of handling the increase in inflation. The government of the 1970s did measures such as income and price regulation; the current government, on the other hand, has increased public expenditures and done little to halter the high inflation (Grytten & Hunnes, 2016; Tjoflot et al., 2023). The current government also seems unwilling to demand a freeze in incomes amongst workers, fearing alienating potential voters.

Direct relevance

Today's economy has many similarities with the one in the 1970s. Years of stable economic growth prior, expectations of a perpetual growth trend, exogenous shocks, inflation, and halting GDP are examples of such. It might be arguable that the economy has overheated slowly during the last 20 years, and it has not been able to be financially stable enough to handle the exogenous shocks we are currently experiencing. When facing problems, there are signs that the current government, as a hegemony power, is less able to take the necessary measures, such as decreasing public spending.

8. Conclusions

In this thesis, we sought to answer the following research question:

Is the Norwegian economy heading into a crisis?

To answer this, we have relied on two sub-questions:

- i) What indicators are there for different stages of a crisis?
- ii) How does the present-day situation compare to historical crises?

When analysing whether the Norwegian economy is heading into a crisis, we used the seven-step dynamic crisis model as a framework.

In the last couple of years, the economy has faced numerous exogenous shocks, such as the coronavirus and the outbreak of war in Ukraine, all likely to kick off the creation of financial instability.

Investigating if the economy has become overheated, one could argue, according to the Taylor rule, that the interest rate has been too low the last decade and, therefore, has allowed Norwegian households and businesses to become more leveraged, contributing to overheating. This has happened with consumer and export-driven GDP growth, with perhaps too low gross total investments to sustain the long-term growth trend in the economy.

On the other hand, one can argue that no overheating occurred in the Norwegian economy during this decade. Based on the increase in the money supply, there is currently no abnormally large cyclical deviation, which is normally found during the overheating of an economy. However, after the outbreak of the covid-19 pandemic, we witnessed a rapid, and strong increase in the money supply, housing prices, GDP, and the stock market. These are strong indications of an overheated economy, nearing a bubble state.

There have been signs of bubble tendencies in the last years in the Norwegian economy. The money supply has risen, and households have gotten a surplus due to maintained wages coinciding with a shutdown of services to spend them on. The extra cash available in the economy leads to higher investments in assets, thus pushing the prices of real estate and OSEBX

rapidly upwards. The developments in Tobin's Q, support the argument for bubble tendencies. The stock markets prices have seemingly increased at a higher phase than acquisition costs, represented by the book values.

There was also a discussion of whether it was a long-term bubble in the housing market due to the Norwegian real estate price deflated with GDP per capita, which has increased more than ten times over the last 50 years. However, some will explain the price growth, arguing that the housing quality has improved, and there is a lack of houses being built, thus justifying the tremendous increase in housing prices.

Furthermore, after a longer period of steep growth, the OSEBX and housing market plateaued from the summer of 2022 to December 2023, with only smaller positive and negative fluctuations as the market reacted strongly to new information. This indicates that the market is in a nervous state. At the same time, the government also seems nervous, and has changed legislation to give easier access to credit and has increased public spending by about NOK 33 billion in the revised national budget, an increase driven by oil money.

Even though it seems the markets are facing considerable nervousness at the moment and the double derivative growth of OSEBX, gross domestic investment, GDP and private consumption is negative, we do not see any clear signs of the crucial Minsky moment happening in the near future. However, due to the nervousness in the markets, it is not unlikely that the Minsky moment will be triggered if a new exogenous shock occurs, and the overall psychology turns pessimistic.

It is not straightforward if or even what stage of the seven-step dynamic crisis model we can place the present-day Norwegian economy under. Some indicators show that the economy at least has overheated during the last few years and that there have been bubbles within certain markets. However, problems with deciding the true long-term growth trend make it incredibly difficult to predict whether the economy is off trend or not in real-time.

Based on the discussion surrounding the coherence within the Norwegian Economy and the various stages in the model, we believe that the Economy could be in a state of financial instability and that there has been a prolonged overheating period before the COVID-19 crisis. During the crisis, we will argue that several asset bubbles formed, and that monetary and fiscal

policy contributed to further financial instability. As of December 2023, there seems to be a lot of nervousness and uncertainty. Growth has plateaued, and inflation is up.

What shape a potential crisis might take is uncertain. From our empirical discussion and analysis, we believe stagflation is the likely outcome of the present-day situation. Looking at the stagflation in the 1970s and the situation today, there are many clear similarities, such as global logistic problems of input factors, local conflicts affecting world trade and a prior period of massive growth and growth expectations. The central bank shows resolve in solving the inflation problem, while the government increases spending, perhaps contributing to more inflation, but on the other hand strengthens short-term economic growth.

To answer the main problem thesis clearly; yes, we do believe the Norwegian economy is heading into crisis, and that there has been long-term overheating. Furthermore, we find it likely that the economy might enter a state of stagflation.

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9.1 Apendix A – Formulas

$$i_t = \pi_t + r_t^* + \alpha_\pi(\pi_t - \pi_t^*) + \alpha_y(y_t - y_t^*), 3.1$$

$$\text{Tobin's } Q = \text{Total Market Value} \frac{\text{Total Market Value}}{\text{Total Asset Replacement Value}}, 3.2$$

$$\text{Tobin's } Q = \text{Total Market Value} \frac{\text{Equity Market Value} + \text{Liabilities Market Value}}{\text{Equity Book Value} + \text{Liabilities Book Value}}, 3.3$$

$$\text{Tobin's } Q = \text{Total Market Value} \frac{\text{Equity Market Value}}{\text{Equity Asset Value}}, 3.4$$

$$\text{Tobin's } Q = \text{Total Market Value} \frac{\text{Equity Market Value}}{\text{Equity Book Value}}, 3.5$$

$$x_t = f(g_t, c_t, s_t, i_t), 6.1$$

$$x_t = g_t + c_t + s_t + i_t, 6.2$$

$$x_t = x_t - (g_t + c_t + s_t), 6.3$$

$$x_t = g_t + c_t, 6.4$$

$$\sum_{t=1}^t (x_t - g_t)^2 + \lambda \sum_{t=2}^{t=1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2, 6.5$$

$$c_t = x_t + g_t, 6.6$$

$$\ln \ln (c_t) = \ln \ln (x_t) - \ln (g_t), 6.7$$

$$\sum_{t=1}^t (x_t - g_t)^2 = x_t + \lambda \sum_{t=2}^{t=1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2, 6.8$$

$$\ln \ln (c_t) = \ln \ln (x_t) - \ln (\lambda \sum_{t=2}^{t=1} [(g_{t+1} - g_t) - (g_t - g_{t-1})]^2), 6.9$$

$$c'(t) = \frac{d}{dt}(x_t - g_t) = \frac{d}{dt}x_t - \frac{d}{dt}g_t, 6.10$$

$$c'(t) = x'(t) - g'(t), 6.11$$

$$c''(t) = \frac{d}{dt}(x'(t) - g'(t)), 6.12$$

$$c''(t) = \frac{d}{dt}x'(t) - \frac{d}{dt}g'(t), 6.13$$

$$\text{Real Interest Rate} = \text{Nominal Rate of Interest} - \text{Inflation Rate} - \text{Tax Benefit}, 6.14$$