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The dynamics of macroeconomic indicators and stock market returns: An econometric perspective on advanced economies

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Abstract: This study aims to analyze and examine the short-term and long-term relationships between macroeconomic indicators and stock market returns in Switzerland, Sweden, and Denmark. The research is based on secondary data covering the period from 1927 to 2021. Using empirical analyses such as VAR, Granger causality, and VECM, the study confirms both short-term and long-term relationships between macroeconomic indicators and stock market returns. The results of the analyses indicate that economic growth has a significant positive relationship with stock market returns, while a long-term negative effect of this indicator was confirmed in Switzerland. The short-term interest rate had a negative relationship with stock market returns in the short term only in Denmark, but similar results were not confirmed for Sweden and Switzerland. Population growth showed a positive effect on stock market returns in Sweden and Denmark in the short term but not in Switzerland. Inflation was not found to be a significant indicator for stock market returns in any of the three countries.
Keywords: *GDP per capita, Inflation rate, Short-term interest rate, Stock market returns.*

1. Introduction

The banking and financial markets are fundamental accelerators and key players in the economy. Many scholars argue that the stock market serves as a primary indicator of a country's economic growth. Consequently, in today's financial landscape, stock market performance is widely regarded as a measure of economic growth stability. Given the stock market's high sensitivity to overall market conditions, numerous researchers have focused their studies on the impact of various macroeconomic indicators on stock market performance. Furthermore, analyzing the interactions between macroeconomic indicators including economic growth, inflation, interest rates, and population growth—on stock market returns is crucial for policymakers and investors. The extent to which macroeconomic indicators drive stock market returns remains an ongoing subject of debate.

According to Khan, et al. [1] macroeconomic indicators such as interest rates, inflation, and GDP growth serve as critical barometers of economic health, significantly influencing market movements. Additionally, population growth is another factor that can affect fluctuations in financial markets, as individuals have varying financial needs at different stages of life borrowing when young, investing for retirement in middle age, and divesting upon retirement Geanakoplos, et al. [2]. Poterba [3] further asserts that if individuals were rational in their financial decisions, they would anticipate any stock price increases driven by demographic changes.

Similarly, this study focuses on the aforementioned indicators, as Switzerland, Sweden, and Denmark have high GDP levels. According to a report published by *Global Finance* in 2023, these three countries rank among the nations with the highest GDP in the world. They are also classified as highly developed economies by scholars such as Lee and Choi [4] who further describe their financial markets as advanced. The findings of this research confirm that advanced financial markets are more efficient compared to those in developing economies. Empirical evidence suggests that highly developed

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economies are more resilient than lower-income countries, making their financial markets more predictable. However, Lee and Choi [4] emphasize that open economies, such as Switzerland, Denmark, and Sweden, are more vulnerable to global financial crises compared to more closed economies, such as Japan and other Asian nations.

Based on the above considerations, this study aims to provide measurable results on the impact of macroeconomic indicators—including GDP per capita, short-term interest rates, inflation rates, and population growth—on stock market returns using advanced econometric analyses such as Vector Autoregression (VAR) and the Vector Error Correction Model (VECM). The findings of this research intend to serve as a valuable database for policymakers and investors in their decision-making processes.

Through these analyses, the study aims to determine whether macroeconomic indicators in Switzerland, Sweden, and Denmark have any short-term or long-term relationship with stock market returns. The study also incorporates the Granger causality test to examine the direction of causality between macroeconomic variables and stock market returns.

The research findings will contribute to the existing literature by providing empirical evidence on how macroeconomic indicators influence stock market performance across different economic environments. Additionally, the findings of this study will assist policymakers in formulating concrete macroeconomic policies that promote stable financial markets. At the same time, the results will support investors in making informed investment decisions, particularly regarding risk management and responsiveness to changes in financial market conditions.

2. Literature Review

In the general literature, it is well established that macroeconomic indicators are decisive factors in the stability of capital markets. Therefore, analyzing these indicators is crucial for predicting stock market performance. Chen, et al. [5] emphasize that stock prices respond to external factors, particularly market conditions. Furthermore, relying on capital market theory, the authors argue that overall economic conditions can influence stock market prices. Based on their findings, it can be inferred that any variable affecting economic price mechanisms may impact stock market returns.

From general knowledge and literature review, economic growth is recognized as a highly significant macroeconomic factor influencing stock market performance, as well as business profitability, investor confidence, and overall societal well-being. The research findings of Pan and Mishra [6] confirmed that, in the short term, no significant relationship exists between economic growth and the stock market. However, in the long run, their results demonstrated that economic growth fosters stock market development. Similarly, Mehrara, et al. [7] found a positive relationship between economic growth and stock market performance. On the other hand, Dabwor, et al. [8] who analyzed stock market returns and economic growth, identified a positive but statistically insignificant relationship.

Many scholars consider the inflation rate a key determinant of financial market fluctuations. Countries with advanced financial systems, such as Switzerland, Denmark, and Sweden, implement various monetary policy instruments aimed at price stability. However, given that these three countries have open and internationally integrated economies, they are not immune to global financial crises. From general economic knowledge, it is understood that an increase in inflation leads to currency depreciation. Bahloul, et al. [9] highlight that the underlying cause of inflation is crucial—if inflation is driven by a monetary shock, it could result in lower interest rates, prompting investors to shift their assets from cash to stocks and bonds to maximize returns. Meanwhile, Fama and Gibbons [10] through the Mundell-Tobin model, confirm that high interest rates and expected inflation rates encourage asset reallocation from cash to bonds, ultimately reducing expected real stock market returns.

Numerous authors have investigated the relationship between inflation and stock market returns. Humpe and Macmillan [11] established a negative long-term correlation between inflation and stock market prices, aligning with the findings of other scholars. Their results indicate that high inflation rates lead to market instability and create uncertainty among investors regarding long-term investments. However, according to economic theory, a moderate inflation rate can stimulate economic growth and potentially lead to higher returns in stock markets.

On the other hand, Bernanke and Kuttner [12] demonstrate that a tight monetary policy through high interest rates lowers stock prices, as it reduces investors' willingness to take on risk. Consistent with the findings of the aforementioned study, Jabeen, et al. [13] also confirmed a significant negative relationship between interest rates and stock market returns. Similarly, Bahloul, et al. [9] in their study on Islamic countries, found that short-term interest rates negatively affect stock market returns. According to their research, high interest rates decrease the present value of cash flows due to discounting, which in turn reduces investment incentives and negatively impacts stock market returns.

Although there is limited research on the effect of population growth on stock market returns, the inclusion of this variable in the model is motivated by the fact that Switzerland, Denmark, and Sweden are highly developed economies that have experienced increasing migration inflows. Population growth indirectly influences financial market performance, as an increase in population can lead to higher consumer demand and an expanded labor force. This, in turn, can impact pension funds and contribute to corporate performance, as corporations may reinvest their profits into financial markets. Poterba [3] highlights that demographic demand driven by savings influences stock price appreciation.

On the other hand, DellaVigna and Pollet [14] analyzed the impact of demographic changes across industries, arguing that such shifts affect profits and returns across various sectors. Their findings demonstrated that forecasted demographic demand five to ten years into the future can predict annual stock returns within specific industries.

3. Methodology

The objective of this research is to examine the short-term and long-term relationship between macroeconomic indicators and stock market returns, focusing on Switzerland, Sweden, and Denmark. The study is based on secondary data covering the period from 1927 to 2021. Through empirical models, we aim to explore the interconnection between nominal stock market returns (N_RETURNS), GDP per capita (GDPCAP), inflation (CPI), short-term interest rates (IR_SH), and population growth (POPGR).

Furthermore, part of the data was sourced from the database used in the working paper published by the Swiss National Bank (SNB) by Fuhrer and Herger [15]. This paper compiled data on population growth (POPGR), GDP per capita, the Consumer Price Index (CPI), and short-term interest rates for the period 1927-1970 for Switzerland, Sweden, and Denmark. Additionally, the same macroeconomic variables for the years 1970-2021 were retrieved from World Bank and OECD statistics.

The frequency of the data for empirical analysis over the period 1927-2021 is annual. Data processing was applied only to GDP per capita, which was converted from USD to the logarithmic form of the variable. Based on the collected data, we seek to identify the impact of macroeconomic indicators on stock market returns.

To test the variables, we will employ the Vector Autoregression (VAR) model, which identifies short-term relationships between past and present values for each variable. Additionally, we apply the Granger causality test to examine the causal relationships between the variables. Finally, if cointegration is present and the variables exhibit co-movement, we will adopt the Vector Error Correction Model (VECM), utilizing a restricted VAR framework.

The empirical analysis will be conducted using EViews 12 statistical software.

Considering the aforementioned steps, we aim to provide a more in-depth explanation before proceeding with our data analysis. In light of a step-by-step explanation of the methodology, we seek to address the following research questions:

Q1: Is there a relationship between economic growth and stock market returns?

Q2: Are inflation (CPI) and short-term interest rates (IR_SH) key determinants of stock market fluctuations?

Q3: Is there a relationship between population growth and stock market returns, and how does this relationship differ among Switzerland, Sweden, and Denmark?

4. Empirical Analysis Results

4.1. Unit Root Test

Before proceeding with the VAR estimation, the variables must be integrated at the same level. Due to the importance of stationarity in individual variables, we test each variable separately. According to the literature, if any of the variables appear to be non-stationary, they must be integrated at order I(1). This process involves differencing the current value with its previous value (e.g., Xt − Xt-1), resulting in the loss of one observation. Hence, if a variable is non-stationary, it must be integrated at order I(1).

The Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test help us examine unit roots and compare the results based on probability rules. By applying the ADF and PP tests, there is an option to include only a constant within the regression, both a constant and a trend as coefficients, or none of them.

Based on the literature, we can illustrate the regression model as follows:

- $d(X_t) = C_1X_{t-1} + C_2 + e_t$ – *Normal linear regression with constant (C_2)*
- $d(X_t) = C_1X_{t-1} + C_2 + C_3@Trend + e_t$ – *Trend (@Trend) and constant (C_2) within regression*
- $d(X_t) = C_1X_{t-1} + e_t$ – *Removing Trend and constant*

To conduct the unit root test, we use two approaches. First, we compare the t-statistics with the critical t-values; in this case, if the t-statistics are higher than the critical t-values at a 1% or 5% significance level, the variable is considered stationary. Second, we base our findings on the probability rule, as the analysis will be carried out in this section. When the p-value is less than 1% or 5%, it indicates that the variable is stationary (see Appendix A-1).

Since some variables were found to be non-stationary in the unit root test (see Appendix A-1, Table 1), we integrated them at the first-order I(1). According to Brockwell and Davis (2016), the first difference unit root is simply the difference between the current and previous values of a given variable. In our case, the first-differenced variables appear as follows:

<u>DN_RETURNS</u> = N_RETURNS – N_RETURNS (-1)
<u>DLGDPCAP</u> = LGDPCAP – LGDPCAP (-1)
<u>DIR_SH</u> = IR_SH – IR_SH (-1)
<u>DCPI</u> = CPI – CPI (-1)
<u>DPOPGR</u> = POPGR – POPGR (-1)

Following this outlined structure, we test each variable individually, and the results are presented in Table 1.

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Table 1.
Unit root test results at level.

Variables	T-statistics (ADF)	T- Critical Values 1% level of significance	T- Critical Values 5% level of significance	Probability (Prob.)
Switzerland				
DN_RETURNS	-8.018189	-3.506484	-2.894716	0.0000*
DLGDPCAP	-8.126713	-3.501445	-2.892536	0.0000*
DIR_SH	-8.943069	-3.502238	-2.892879	0.0000*
DCPI	-8.933392	-3.502238	-2.892879	0.0000*
DPOPGR	-8.323602	-3.501445	-2.892536	0.0000*
Sweden				
DN_RETURNS	-8.585508	-3.504727	-2.893956	0.0000*
DLGDPCAP	-7.626860	-3.501445	-2.892536	0.0000*
DIR_SH	-10.50919	-3.501445	-2.892536	0.0000*
DCPI	-8.681854	-3.503049	-2.893230	0.0000*
`DPOPGR	-7.260216	-3.502238	-2.892879	0.0000*
Denmark				
DN_RETURNS	-7.758891	-3.506484	-2.894716	0.0000*
DLGDPCAP	-8,955,249	-3.501445	-2.892536	0.0000*
DIR_SH	-11.05273	-3.501445	-2.892536	0.0000*
DCPI	-10.63478	-3.502238	-2.892879	0.0000*
DPOPGR	-7.483284	-3.501445	-2.892536	0.0000*

Note: *- indicates that variables are stationary at level – 1% and 5% level of significance.

According to Table 1, we have confirmation to proceed with the VAR model and the Granger Causality test, as all variables appear to be stationary at the first difference.

4.2. Results of Vector Auto Regression (VAR)

Vector Auto Regression (VAR) models represent a methodology designed to address the research questions by analyzing the relationship between the selected variables. The literature defines VAR as a multi-equation model that includes more than one endogenous variable. In this way, we analyze the interrelationship between the selected variables while accounting for their past values and the influence of other variables within the regression framework.

An illustration of the VAR methodology with a combination of two variables can be represented as follows:

$$y_{1t} = \alpha_{12} + \alpha_{13}y_{1t-1} + \cdots + \alpha_{1k}y_{1t-k} + \beta_{13}y_{2t-1} + \cdots + \beta_{1k}y_{2t-k} + u_{1t}$$
$$y_{2t} = \alpha_{21} + \alpha_{22}y_{2t-1} + \cdots + \alpha_{2k}y_{2t-k} + \beta_{22}y_{1t-1} + \cdots + \beta_{1k}y_{1t-k} + u_{2t}$$

This equation contains likewise the error term u_{it} which is supposed to be in the line with the assumption E(u_{it})= 0, in the our case the expectation includes two regressions and two disturbance terms E(u_{1t}, u_{2t})= 0.

This study examines three VAR models for three different countries. Furthermore, we use similar variables for the three VAR models (for Switzerland, Sweden, and Denmark) because, beyond identifying the relationships between the variables, we will also obtain comparable results across the three datasets, which may be significant for future research.

We will analyze Switzerland, Sweden, and Denmark in separate VAR models to examine the short-term relationship between the following variables: (DN_RETURNS), (DLGDPCAP), (DCPI), (DIR_SH), and (DPOPGR). In the generated VAR results, we exclude the constant due to its insignificance. In this context, Brooks [16] argues that all results are statistically tested by comparing the t-statistics with the critical t-value, which is determined by the significance level (tα), the number of observations (T), and the number of variables used in the model. The critical t-value accounts for all variables in the model, and an illustration of the determination of critical t-values follows.

$$t_c = (\frac{t_\alpha}{2})\,; T - m \qquad (1)$$

According to this formula, we find the critical t-value, which is valid for all three VAR regressions used in this section, as we apply the same number of observations, variables, and significance level.

$$t_c = \left(\frac{0.05}{2}\right); 93 - 5 = 0.025\,; 88 = 1.9867$$

According to Brooks [16] whenever the t-statistics in absolute value are greater than the critical t-value, we can conclude that the relationship between the dependent and independent variables is statistically significant.

From the results presented in Appendix A2 (Table 2.1) for Switzerland, we observe a positive and significant relationship between economic growth (DLGDPCAP) and stock market returns (DN_RETURNS). Additionally, there is a positive but insignificant relationship between population growth (DPOPGR), short-term interest rates (DIR_SH), and stock market returns. On the other hand, in the regression model for Switzerland, we find a negative and significant relationship between inflation (DCPI) and economic growth (DLGDPCAP), while there is also a positive and significant relationship between DLGDPCAP and DCPI.

In the results presented in Appendix A2 (Table 2.2) for Sweden, we similarly observe a positive and significant relationship between economic growth (DLGDPCAP) and stock market returns (DN_RETURNS). Moreover, there is a positive and significant relationship between population growth (DPOPGR) and stock market returns (DN_RETURNS). However, inflation (DCPI) and short-term interest rates (DIR_SH) did not show any significant relationship with stock market returns (DN_RETURNS).

Similarly, in the regression model results for Denmark, presented in Appendix A2 (Table 2.3), we find no significant short-term relationship between economic growth (DLGDPCAP) and stock market returns (DN_RETURNS). However, a significant reverse relationship is observed. Additionally, we find a positive and significant relationship between population growth (DPOPGR) and stock market returns. On the other hand, at the second level of analysis, we observe a negative relationship between short-term interest rates (DIR_SH) and stock market returns (DN_RETURNS).

4.3. Granger Causality Results

Granger Causality is always a follow-up test after executing the VAR model. By performing the Granger Causality test, we can gain deeper insights into the relationship between the analyzed variables, determining whether one variable "Granger-causes" another, leading to either a unidirectional or bidirectional relationship between them. We execute the Pairwise Granger Causality test in EViews, which allows us to test the hypothesis derived from this approach.

Based on the results of the Pairwise Granger Causality test, we verify whether a variable Granger-causes another by referring to the probability value (Prob). If the probability value is less than 0.01 or 0.05, we confirm the existence of Granger Causality between the variables.

From the results presented in Appendix A2 (Table 2.4) for Switzerland, we observe that economic growth (DLGDPCAP) Granger-causes stock market returns (DN_RETURNS) in both directions. Additionally, we find Granger Causality between inflation (DCPI) and economic growth (DLGDPCAP) in both directions. However, this relationship is not observed between other variables.

In the results presented in Appendix A2 (Table 2.5) for Sweden, we also observe that economic growth (DLGDPCAP) Granger-causes stock market returns (DN_RETURNS) in both directions. However, this is not the case for the relationship between economic growth (DLGDPCAP) and inflation (DCPI), as Granger Causality is found only in one direction. Additionally, population growth (DPOPGR) has a limited effect on stock market returns.

Similar results are observed for Denmark, as presented in Appendix A2 (Table 2.6), where economic growth (DLGDPCAP) Granger-causes stock market returns (DN_RETURNS), but not vice versa.

Unlike the other two countries, in Denmark, stock market returns (DN_RETURNS) Granger-cause short-term interest rates (DIR_SH), but only in one direction. Furthermore, the results indicate that inflation (DCPI) Granger-causes economic growth (DLGDPCAP), but not in both directions, as the probability value is 0.07 > 0.05. The results confirm that there is no Granger Causality between the other variables.

4.4. Cointegration Test Results

To apply the Johansen test, all variables must be integrated at the same order I(d), as supported by Brooks [16] who argues that "if a set of variables Xi,tX_(i,t) with different integration orders are combined, the combination will have an integration order equal to the highest among them" (p. 457). Considering this, we integrate all variables at order I(1), including those that are stationary. However, during the execution of the VECM model, the error correction term integrates the variables to be stationary at level.

To adhere to the recommended literature, we apply the Johansen cointegration test using EViews. In this context, we ensure that sufficient evidence is available to answer the research questions regarding the long-term relationship between the variables. Furthermore, following the methodology outlined above, we use all variables integrated at order I(1).

Before analyzing the results, it is essential to review the formulas for the Max-Eigen test and the Trace test.

Formula for Trace Test:

$$LRtr(r/n) = -T^* \Sigma\, n\, (1 - \lambda\hat{}) \qquad (2)$$

Formula for Max-Eigen Test:

$$LRmax(r/\ n + 1) = -T * \log\,(1 - \lambda\hat{}) \qquad (3)$$

Table 2.
Cointegration trace test results.

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	Critical Value at 5%	Prob.**
Switzerland				
Variables: DN_RETURNS, DLGDPCAP, DIR_SH, DCPI, DPOPGR				
None *	0.59680	235.409	69.8188	0.0000*
At most 1 *	0.47072	151.844	47.8561	0.0000*
At most 2 *	0.40655	93.3089	29.787	0.0000*
At most 3 *	0.26549	45.3017	15.4947	0.0000*
At most 4 *	0.16794	16.9147	3.84146	0.0000*
Sweden				
None *	0.57450	223.133	69.8188	0.0000*
At most 1 *	0.47109	144.519	47.8561	0.0000*
At most 2 *	0.32660	85.9205	29.7970	0.0000*
At most 3 *	0.23722	49.5414	15.4947	0.0000*
At most 4 *	0.23485	24.6279	3.84146	0.0000*
Denmark				
None *	0.53254	201.820	69.8188	0.0000*
At most 1 *	0.4279	131.859	47.8561	0.0000*
At most 2 *	0.30195	80.4815	29.7970	0.0000*
At most 3 *	0.25884	47.4098	15.4947	0.0000*
At most 4 *	0.19408	19.8513	3.84146	0.0000*

Note: * – Indicates significant result on testing the co-integration at 1% and 5% level of significance.

Referring to Table 2, we conclude that there is a long-term relationship among the five variables in the three countries at a 1% significance level, confirming the existence of cointegration between stock market returns, GDP per capita, short-term interest rates, inflation rate, population growth, and stock market returns. The results presented in Table 2 (additional test results in Appendix A3) indicate that

VECM should be used to analyze the long-term interaction or relationship between the variables due to the presence of cointegration.

4.5. VECM Results

The final step of the analysis is to examine the long-term relationship between the selected variables and attempt to answer the research questions. Since the findings suggested the existence of cointegration among the variables, it is essential to proceed with VECM to distinguish between short-term and long-term effects [17]. We follow this final step by running VECM on the long-term relationship between the variables, as previously done, by comparing the t-statistics with the critical t-values. These findings provide further support for the discussion and recommendations addressed in the following sections.

From the VECM model results presented in Appendix A4 (Table 4.1) for Switzerland, we observe a negative and significant relationship between economic growth (LGDPCAP) and stock market returns (DN_RETURNS). A negative and significant relationship is also confirmed between inflation (DCPI) and economic growth (LGDPCAP). However, short-term interest rates, inflation, and population growth do not show a significant relationship with stock market returns, confirming that these indicators are not key determinants of long-term stock market returns.

Similarly, the VECM analysis results for Sweden, presented in Appendix A4 (Table 4.2), show findings similar to those for Switzerland. A significant relationship is observed between stock market returns (DN_RETURNS) and economic growth (LGDPCAP), but not in the reverse direction. The results indicate that stock market returns positively impact GDP growth, but economic growth does not have a significant impact on stock market returns. Additionally, in Sweden, the findings confirm that in the long term, other macroeconomic factors are not key determinants of stock market returns.

The VECM model results for Denmark, presented in Appendix A4 (Table 4.3), show nearly identical findings. The results confirm a positive relationship between stock market returns (DN_RETURNS) and economic growth (LGDPCAP), but again, no significant relationship is observed in the reverse direction. A positive but insignificant relationship is also identified between short-term interest rates and stock market returns. On the other hand, a negative but insignificant relationship is confirmed between inflation and stock market returns.

5. Discussion of Results

The objective of this study was to examine the short-term and long-term relationships between macroeconomic indicators and stock market returns. We applied VAR models, Granger Causality, and VECM to address the research questions. The unit root test results indicated that the variables were non-stationary, requiring first order differencing to proceed with the VAR model. Cointegration and VECM were used to distinguish between short-term and long-term relationships among the variables and to support the study's research objectives.

The findings reveal mixed relationships across the three countries Switzerland, Sweden, and Denmark between macroeconomic indicators and stock market returns. The results confirm that economic growth has a significant positive short-term relationship with stock market returns, except in Denmark, where the relationship was insignificant. The Granger Causality test further supports that economic growth influences stock market returns in all three countries, as the probability coefficient (Prob.) < 0.05. Additionally, the results confirm a significant relationship between economic growth and stock market returns in Sweden, but not in Denmark, where the relationship was insignificant.

On the other hand, in Switzerland, the findings indicate that long-term economic growth negatively impacts stock market returns.

Based on the results, we can conclude that in Switzerland and Sweden, an increase in GDP contributes to higher stock market returns. According to the literature and the findings of this study, economic growth fluctuations can serve as a basis for forecasting stock market returns in these two

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countries. However, this is not the case for Denmark, as economic growth has not been identified as a key determinant of stock market returns in either the short-term or long-term.

The findings of this study align with those of Oskooe [18] who confirms a positive relationship between economic growth and stock market returns, emphasizing that GDP growth increases the expected future cash flow, which contributes to enhancing corporations' economic opportunities and profitability, ultimately leading to higher stock prices. Similarly, the results of Paramati and Gupta [19] confirm that economic growth plays a crucial role in determining stock price movements, supporting the argument that economic growth is likely to stimulate and foster stock market development through the proper reallocation of resources.

On the other hand, Nordmark [20] who studied the relationship between economic growth and stock market returns in Sweden, found no significant relationship or Granger Causality between these indicators, confirming that economic growth in Sweden from 1993 to 2008 had no connection with stock market performance. Other researchers have suggested that economic growth does not necessarily reflect the expansion of existing firms, as it may also result from the entry of new businesses into the market, which might not directly impact stock market returns. The literature also suggests that global economic conditions and domestic monetary policies can contribute to the insignificant long-term relationship between economic growth and stock market returns [21].

The negative relationship between economic growth and stock market returns found in Pan and Mishra [6] in their study on China supports the argument that the Chinese stock market serves as a tool for government policy objectives rather than a true reflection of economic growth. They also point to the possible existence of irrational exuberance in China's stock markets, which can lead to financial bubbles.

From a broader economic perspective, the negative effect of economic growth on stock market returns in Switzerland can be explained by the fact that Switzerland, as a highly developed and stable economy, is often used by investors as a safe haven to preserve their capital. However, when the global economy experiences rapid growth, investors might shift their capital to higher risk, higher return markets as part of their portfolio diversification strategy. This capital outflow can, in turn, have a negative long-term impact on stock market returns in Switzerland.

The results of this study reveal varied relationships between inflation and stock market returns. Based on the VAR analysis, Granger Causality, and VECM models, we observe that inflation has a negative long-term relationship with stock market returns in Switzerland. On the other hand, the results for Sweden and Denmark indicate a positive relationship between inflation and stock market returns.

The Granger Causality test results for these two countries, based on their coefficients (Prob. = 0.0035 for Sweden, Prob. = 0.0284 for Denmark), suggest that inflation movements may serve as a limited predictor of stock market returns. However, the relationship between inflation and stock market returns was not found to be statistically significant in any of the three countries.

According to the research by Fama and Gibbons [10] moderate inflation can stimulate economic growth, which in turn contributes to higher stock market returns. However, the authors also emphasize that an increase in inflation rates due to monetary effects raises uncertainty among investors and reduces purchasing power, leading individuals to shift their holdings from cash to debt instruments.

In line with these findings, Sathyanarayana and Gargesa [22] support the negative relationship between inflation and stock market returns, arguing that high inflation can affect the economy in multiple ways. It erodes the purchasing power of money, discourages investments, and reduces the value of savings, impacting all segments of the economy.

The findings of this study confirm that in Sweden and Denmark, there is a negative relationship between short-term interest rates and stock market returns, although this relationship does not appear to be significant for Sweden. The Granger Causality test results also confirm that only in Denmark does the inflation rate impact stock market returns.

Analyzing this result, we can assume that as short-term interest rates increase, companies face higher costs, which in turn may lead to a rise in liabilities and, consequently, a decline in stock market returns. However, these effects were not observed in the long term, as no significant relationships were confirmed in any of the three countries. Previous research has presented varied findings on the relationship between these indicators. Campbell and Ammer [23] argue that nominal short-term interest rates may have a limited impact on stock returns, as fluctuations in the asset market are likely influenced by multiple factors.

On the other hand, population growth showed a significant positive short-term relationship with stock market returns in Sweden and Denmark, but no significant relationship was found for Switzerland. The Granger Causality test also did not confirm a causal relationship between these two indicators.

Poterba [3] examined the relationship between demographic changes and asset returns in the United States. The results of this study suggested a weak relationship between demographic changes and stock market returns. However, we can argue that population growth, based on age structure, may provide meaningful insights into identifying which demographic categories have a direct impact on financial markets, particularly young individuals and retirees.

6. Conclusion

The objective of this study was to identify the relationships between macroeconomic indicators and stock market returns. To analyze these relationships in detail, we selected the same variables and frequency to determine whether Switzerland, Sweden, and Denmark yield similar results, allowing us to compare the findings. Through empirical analyses using VAR and VECM, we tested short-term and long-term relationships between macroeconomic indicators and stock market returns.

Based on the results, we can confirm that economic growth was the most significant factor influencing stock market returns, although in the long term, this effect was not observed in Denmark and was found to be negative in Switzerland. Short-term interest rates had a negative short-term effect only in Denmark, but no significant relationship was observed between interest rates and stock market returns in the other two countries. The findings also revealed a complex relationship between population growth and stock market returns in Sweden and Denmark, but no significant relationship was found for Switzerland. The results further indicated that inflation was not a significant determinant of stock market returns in any of the countries studied.

Given the negative effect of economic growth on stock market returns in Switzerland, we suggest that investors should be aware that economic growth may signal a decline in stock market returns in the long term. Therefore, the results recommend that investors adopt a portfolio diversification strategy to manage the negative impact on stock market returns. Conversely, investors in Sweden and Denmark benefit from economic growth, as it positively affects their stock market returns.

Additionally, the results suggest that investors in Denmark should be cautious about short-term interest rates, especially during periods of tight monetary policy. On the other hand, the findings recommend that policymakers in Switzerland should manage the negative impact of economic growth on stock market returns by implementing policies that diversify the financial market.

Further research is needed to deepen the analysis of the negative effects of economic growth on stock market returns, including sectoral analyses and long-term effects of integrating new populations into stock market sectors.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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Appendix A1.

Table 1.
Unit Root Test.

Variables	T-statistics (ADF)	Adj. T-statistics (PP)	T- Critical Values 1% level of significance	T- Critical Values 5% level of significance	Probability (Prob.)
			Switzerland		
N_RETURNS	-9.357663	-9.78198	-3.500669	-2.8922	0.0000*
LGDPCAP	-0.154261	2.11166	-3.500669	-2.8922	0.9394
IR_SH	-3.136996	-3.10064	-3.500669	-2.8922	0.0272*
CPI	-4.680057	-3.60768	-3.501445	-2.892536	0.0002*
POPGR	-3.613771	-3.16316	-3.501445	-2.892536	0.0072*
			Sweden		
N_RETURNS	-7.903702	-9.38974	-3.501445	-2.892536	0.0000*
LGDPCAP	-1.186342	-1.18634	-3.500669	-2.892200	0.6778
IR_SH	-1.227858	-1.05492	-3.500669	-2.892200	0.6598
CPI	-3.947785	-3.91026	-3.500669	-2.892200	0.0025*
POPGR	-3.032522	-1.96344	-3.501445	-2.892536	0.0355*
			Denmark		
N_RETURNS	-9.034881	-9.08846	-3.500669	-2.8922	0.0000*
LGDPCAP	-0.707323	-0.70859	-3.500669	-2.8922	0.8391
IR_SH	-1.286927	-1.25157	-3.500669	-2.8922	0.6331
CPI	-5.525335	-5.52727	-3.500669	-2.8922	0.0000*
POPGR	-2.005475	-1.59761	-3.501445	-2.892536	0.2841

Note: *- indicates that variables are stationary at level – 1% and 5% level of significance.

Table 1.1.
ADF – Unit Root test for Switzerland.

Null Hypothesis: N_RETURNS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.35766	0
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: IR_SH has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.137	0.0272
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.61377	0.0072
Test critical values:	1% level	-3.50145	
	5% level	-2.89254	

	10% level	-2.58337	

Table 1.2.
PP – Unit Root Test for Switzerland.

Null Hypothesis: N_RETURNS has a unit root
Exogenous: Constant
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-9.78199	0.000
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: IR_SH has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.10065	0.0298
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: POPGR has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.16317	0.0254
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: LGDPCAP has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-2.20738	0.9328
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-3.60768	0.0073
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Table 1.2.1.
ADF – Unit Root test for Sweden.

Null Hypothesis: N_RETURNS has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.9037	0
Test critical values:	1% level	-3.50145	
	5% level	-2.89254	
	10% level	-2.58337	

Null Hypothesis: IR_SH has a unit root
Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=11)			
		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-1.22786	0.6598
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: POPGR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=11)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-3.03252	0.0355
Test critical values:	1% level	-3.50145	
	5% level	-2.89254	
	10% level	-2.58337	

Null Hypothesis: LGDPCAP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-1.18634	0.6778
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-3.94779	0.0025
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Table 1.2.2.
PP – Unit Root Test for Sweden.

Null Hypothesis: N_RETURNS has a unit root
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-9.38975	0
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: IR_SH has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-1.05492	0.7307
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: POPGR has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-1.96344	0.3024
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	

	10% level	-2.58319	

Null Hypothesis: LGDPCAP has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-1.18634	0.6778
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-3.91027	0.0029
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Table 1.3.
ADF – Unit Root test Denmark.

Null Hypothesis: N_RETURNS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-9.03488	0
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: IR_SH has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.28693	0.6331
Test critical values:	1% level	-3.50067	
	5% level	-2.8922	
	10% level	-2.58319	

Null Hypothesis: POPGR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=11)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-2.00548	0.2841
Test critical values:	1% level	-3.50145	
	5% level	-2.89254	
	10% level	-2.58337	

Null Hypothesis: LGDPCAP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	**Prob.***
Augmented Dickey-Fuller test statistic		-0.707323	0.8391
Test critical values:	1% level	-3.500669	
	5% level	-2.8922	
	10% level	-2.583192	

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=11)

		t-Statistic	**Prob.***

Augmented Dickey-Fuller test statistic		-5.525335	0
Test critical values:	1% level	-3.500669	
	5% level	-2.8922	
	10% level	-2.583192	

Table 1.3.1.
PP – Unit Root Test Denmark.

Null Hypothesis: N_RETURNS has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-9.088461	0
Test critical values:	1% level	-3.500669	
	5% level	-2.8922	
	10% level	-2.583192	

Null Hypothesis: IR_SH has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	Prob.*
Phillips-Perron test statistic		-1.251577	0.6492
Test critical values:	1% level	-3.500669	
	5% level	-2.8922	
	10% level	-2.583192	

Null Hypothesis: POPGR has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-1.597619	0.4799
Test critical values:	1% level	-3.500669	
	5% level	-2.8922	
	10% level	-2.583192	

Null Hypothesis: LGDPCAP has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-0.708593	0.8388
Test critical values:	1% level	-3.500669	
	5% level	-2.8922	
	10% level	-2.583192	

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

		Adj. t-Stat	**Prob.***
Phillips-Perron test statistic		-5.527276	0
Test critical values:	1% level	-3.500669	
	5% level	-2.8922	
	10% level	-2.583192	

Apendix A 2.
VAR Model Results for Switzerland, Sweden and Denmark

Table 2.1.
VAR Model Results for Switzerland.

Included observations: 93 after adjustments
Standard errors in () & t-statistics in [ ]

	DN RETU...	DLGDPPCAP	DIR_SH	DCPI	DPOPGPR
DN RETURNS(-1)	-0.57024	0.025551	-0.592269	-0.75608	0.239407
	-0.10453	-0.00606	-0.66333	-0.98834	-0.15758
	[-5.45550]	[4.21401]	[-0.89287]	[-0.76655]	[1.51925]
DN RETURNS(-2)	-0.47849	0.012515	0.444013	-0.18367	0.298322
	-0.11092	-0.00643	-0.70388	-1.05883	-0.16722
	[-4.31398]	[1.94523]	[0.63081]	[-0.17548]	[1.78405]
DLGDPPCAP(-1)	-0.79092	0.231122	8.80685	-0.00283	1.815947
	-1.68265	-0.09761	-10.6783	-0.00065	-2.53876
	[-0.47006]	[2.36792]	[0.82463]	[-4.32754]	[0.71585]
DLGDPPCAP(-2)	-3.14766	0.482542	-0.699353	-28.0936	0.028742
	-1.09568	-0.09836	-10.761	-16.001	-2.55641
	[-1.85615]	[4.70248]	[-0.08499]	[-1.75574]	[0.01124]
DIR_SH(-1)	-0.00046	0.001004	-0.08054	0.238075	-0.01244
	-0.01808	-0.00105	-0.11475	-0.17062	-0.02726
	[-0.25586]	[0.95724]	[-0.70109]	[1.39534]	[-0.45851]
DIR_SH(-2)	0.000598	4.75E-05	-0.301232	-0.15339	-0.00075
	-0.01823	-0.00106	-0.11571	0.17205)	-0.02749
	[0.03277]	[0.04493]	[-2.60341]	[-0.89156]	[-0.02737]
DCPI(-1)	0.011466	40.98592	0.087227	0.18002	0.000156
	(0.01128)	-15.878	-0.07159	-0.10644	-0.01701
	[1.01649]	[2.58130]	[1.21849]	[1.69122]	[0.00917]
DCPI(-2)		-0.00156	0.046608	-0.24713	-0.01533
	-0.01135	-0.00066	(0.07200)	-0.10706	-0.01711
	[-0.30189]	[-2.36525]	[0.64731]	[-2.30821]	[0.89623]
DPOPGPR(-1)	0.016612	0.000153	0.095551	-0.10961	0.189581
	-0.07209	-0.00418	-0.45746	-0.68022	-0.10868
	[1.23045]	[0.03670]	[0.20887]	[-0.15967]	[1.74428]
DPOPGPR(-2)	-0.13714	0.001022	0.32592	0.717994	-0.128367
	-0.07178	-0.00416	-0.45551	-0.67732	-0.10821
	[-1.83542]	[0.24547]	[0.71551]	[1.06006]	[-1.19626]
R squared	0.352529	0.293265	0.120368	0.240042	0.135106
Adj. R squared	0.282322	0.216631	0.024987	0.157637	0.041322
Suma sq.resids	3.977944	0.013385	160.2044	354.2117	9.041206
S.E. equation	0.218922	0.012699	1.389307	2.06582	0.330047
F statistic	5.021239	3.826829	1.261963	2.912952	1.440614
Log likelihood	14.59901	279.3876	-157.25	-194.1455	-23.5792
Akaike AIC	-0.0989	-5.79328	3.596782	4.390226	0.722133
Schwarz SC	-0.17342	-5.52096	3.869105	4.662549	0.994455
Mean dependent	0.000163	0.008627	-0.04581	-0.004497	-0.00027
S.D. dependent	0.25842	0.014348	1.406996	2.25063	0.337065

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Table 2.2.
VAR Model Results for Sweden.

Included observations: 93 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DN RETU...	DLGDPPCAP	DIR_SH	DCPI	DPOPGPR
DN RETURNS(-1)	-0.576126	0.020519	-0.532162	-1.260066	0.044361
	-0.1113	-0.00588	-0.52078	-1.23144	-0.05422
	[-5.17850]	[3.61105]	[-1.02190]	[-102325]	[0.81822]
DN RETURNS(-2)	-0.472602	0.000739	0.775627	2.086518	0.098338
	-0.12353	-0.00631	-0.578	-1.36679	-0.06018
	[-3.82583]	[0.11714]	[1.34192]	[1.52658]	[1.63418]
DLGDPPCAP(-1)	-1.083599	0.471417	3.864048	23.35645	-2.035205
	-2.13323	-0.10892	-9.98145	-23.6031	-1.03918
	[-0.50796]	[4.32829]	[0.38712]	[0.98955]	[-1.95848]
DLGDPPCAP(-2)	-3.197765	0.206069	1.805527	15.68147	1.689876
	-2.20182	-0.11242	-10.3024	-24.362	-1.07259
	[-1.45233]	[1.83307]	[0.17525]	[0.64369]	[1.57551]
DIR_SH(-1)	0.015884	-0.001541	-0.092326	0.285092	-0.004143
	-0.02491	-0.00127	-0.11655	-0.27561	-0.01213
	[0.63687]	[-1.21150]	[-0.79215]	[1.03441]	[-0.34141]
DIR_SH(-2)	-0.039783	-0.000753	-0.129628	-0.081006	0.003829
	-0.02516	-0.00128	-0.11775	-0.27843	-0.01226
	[-1.58090]	[-0.58611]	[-1.10092]	[-0.29093]	[0.31235]
DCPI(-1)	-0.009082	-0.000406	0.060071	-0.126572	-0.003191
	(0..00953)	-0.00049	-0.04461	-0.10549	-0.00464
	[-0.95260]	[-0.83458]	[1.34655]	[-1.19983]	[-0.68699]
DCPI(-2)	0.003492	0.000246	0.043625	-0.234265	-0.00078
	-0.00925	-0.00047	-0.04326	-0.10231	-0.0045
	[0.37769]	[0.52054]	[1.00835]	[-2.28986]	[-0.17321]
DPOPGPR(-1)	-0.410401	0.023836	1.118205	4.50164	0.470046
	-0.223	-0.01139	-1.04344	-2.48741	-0.10863
	[-1.84034]	[2.09346]	[1.07166]	[1.82444]	[4.32692]
DPOPGPR(-2)	0.084039	-0.021232	-0.853256	-3.818029	-0.252957
	-0.22522	-0.0115	-1.05383	-2.49199	-0.10972
	[0.37313]	[-1.84640]	[-0.80967]	[-1.53212]	[-2.30558]
R squared	0.355886	0.15941	0.098959	0.218354	0.222915
Adj. R squared	0.286042	0.068262	0.001255	0.133598	0.138653
Suma sq.resids	5.076655	0.013234	111.1445	621.3992	1.2047
S.E. equation	0.247315	0.012627	1.157191	2.73641	0.120476
F statistic	5.09546	1.748906	1.261963	2.576246	2.645496
Log likelihood	3.258246	279.9168	-140.2491	-220.2897	70.14487
Akaike AIC	0.141984	-5.804663	3.231162	4.952466	-1.293438
Schwarz SC	0.417306	-5.53234	3.503485	5.224788	-1.021115
Mean dependent	0.001866	0.009775	-0.05957	0.02326	0.004315
S.D. dependent	0.292694	0.013081	1.157918	2.939824	0.129811

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Table 2.3.
VAR Model Results for Denmark.

Included observations: 93 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	DN RETU...	DLGDPPCAP	DIR_SH	DCPI	DPOPGPR
DN RETURNS(-1)	-0.534584 (0.10902) [-4.90356]	0.005879 (0.00881) [0.66753]	-2.016642 (0.60903) [-3.31122]	-2.951458 (1.46046) [-2.02091]	0.023507 (0,04568) [0.51456]
DN RETURNS(-2)	-0.488268 (0.11321) [-4.31284]	0.003188 (0.00915) [0.34859]	0.742652 (0.63246) [1.17423]	0.578448 (1.51663) [0.38140]	0.061808 (0.04744) [1.30284]
DLGDPPCAP(-1)	-1.451574 (1.36409) [-1.06414]	0.148861 (0.11021) [1.35075]	3741481 (7.62042) [0.49098]	22.75496 (18.2737) [1.24523]	1.354397 (0.57161) [2.36943]
DLGDPPCAP(-2)	-2.347758 (1.38205) [-1.69876]	0.263779 (0.11166) [2.36240]	5.516321 (7.72076) [0.71448]	21.39323 (18.5143) [1.15549]	0.937153 (0.57914) [1.61819]
DIR_SH(-1)	0.027959 (0.02113) [1.32303]	-0.000569 (0.00171) [-0.33348]	-0.009786 (0.11806) [-0.08289]	0.095374 (0.28310) [0.33689]	-0.004551 (0.00886) [-0.51389]
DIR_SH(-2)	-0.042622 (0.02035) [-2.09409]	-0.000867 (0.00164) [-0.52751]	0.075248 (0.11370) [0.66180]	0.024242 (0.27266) [0.08891]	-0.004588 (0.00853) [-0.53796]
DCPI(-1)	0.004711 (0.00830) [0.56775]	-0.002402 (0.00067) [-3.58236]	-0.018264 (0.04636) [-0.39399]	- 0.005572 (0.11116) [-0.05013]	-0.009743 (0.00348) [-2.80212]
DCPI(-2)	-0.002403 (0.00765) [-0.31398]	0.001163 (0.00062) [1.88203]	-0.030859 (0.04275) [-0.72188]	-0.307560 (0.10251) [-3.00034]	0.001425 (0.00321) [0.44451]
DPOPGPR(-1)	0.598059 (0.26255) [2.27785]	0.004862 (0.02121) [0.22919]	-0.893434 (1.46675) [-0.60913]	1.028779 (3.51726) [0.29249]	0.280112 (0.11002) [2.54597]
DPOPGPR(-2)	0.221692 (0.25743) [0.86117]	-0.014488 (0.02080) [-0.69662]	-1.555816 (1.43814) [-1.08182]	-0.702143 (3.44866) [-0.20360]	-0.100700 (0.10788) [-0.93348]
R squared	0.384563	0.071063	0.200518	0.229046	0.198097
Adj. R squared Suma sq.resids	0.317829 4.110314	-0.029665 0.026829	0.113827 128.2773	0.145448 737.6439	0.111144 0.721762
S.E. equation	0.222535	0.017979	1.243185	2.981153	0.093252
F statistic	5.762622	0.705490	2.313021	2.739867	2.278203
Log likelihood	13.07687	247.0546	-146.9154	-228.2564	93.96637
Akaike AIC	-0.066169	-5.097948	3.374526	5.123793	-1.805728
Schwarz SC	0.206153	-4.825625	3.646848	5.396115	-1.533406
Mean dependent	0.001382	0.008820	-0.055170	-0.009107	-0.002622
S.D. dependent	0.269434	0.017718	1.320616	3.224892	0.098910

Granger Causality Results

Table 2.4.
Pairwise Granger Causality test for Switzerland.

Sample: 1927 2021
Lags: 2

Null Hypothesis:	Obs.	F-Statistic	Prob.
DLGDPCAP does not Granger Cause DN_RETURNS	93	4.85645	0.0100
DN_RETURNS does not Granger Cause DLGDPCAP		5.61359	0.0051
DIR_SH does not Granger Cause DN_RETURNS	93	0.04921	0.9520
DN_RETURNS does not Granger Cause DIR_SH		0.47971	0.6206
DCPI does not Granger Cause DN_RETURNS	93	0.21171	0.8096
DN_RETURNS does not Granger Cause DCPI		0.23737	0.7892
DPOPGR does not Granger Cause DN_RETURNS	93	2.14126	0.1236
DN_RETURNS does not Granger Cause DPOPGR		2.81151	0.0655
DIR_SH does not Granger Cause DLGDPCAP	93	1.11190	0.3335
DLGDPCAP does not Granger Cause DIR_SH		1.23164	0.2968
DCPI does not Granger Cause DLGDPCAP	93	10.6561	7.E-05
DLGDPCAP does not Granger Cause DCPI		4.02258	0.0213
DPOPGR does not Granger Cause DLGDPCAP	93	0.20431	0.8156
DLGDPCAP does not Granger Cause DPOPGR		1.13117	0.3273
DCPI does not Granger Cause DIR_SH	93	1.31903	0.2726
DIR_SH does not Granger Cause DCPI		1.44029	0.2424
DPOPGR does not Granger Cause DIR_SH	93	0.36364	0.6962
DIR_SH does not Granger Cause DPOPGR		0.71528	0.4919
DPOPGR does not Granger Cause DCPI	93	0.39514	0.6748
DCPI does not Granger Cause DPOPGR		0.75070	0.4750

Table 2.5.
Pairwise Granger Causality test for Sweden.

Sample: 1927 2021
Lags: 2

Null Hypothesis:	Obs.	F-Statistic	Prob.
DLGDPCAP does not Granger Cause DN_RETURNS	93	6.02731	0.0035
DN_RETURNS does not Granger Cause DLGDPCAP		7.51555	0.0010
DIR_SH does not Granger Cause DN_RETURNS	93	1.06761	0.3482
DN_RETURNS does not Granger Cause DIR_SH		1.05179	0.3537
DCPI does not Granger Cause DN_RETURNS	93	0.89914	0.4106
DN_RETURNS does not Granger Cause DCPI		1.99228	0.1425
DPOPGR does not Granger Cause DN_RETURNS	93	1.16692	0.3161
DN_RETURNS does not Granger Cause DPOPGR		0.57747	0.5634
DIR_SH does not Granger Cause DLGDPCAP	93	2.56074	0.0830
DLGDPCAP does not Granger Cause DIR_SH		1.21191	0.3025
DCPI does not Granger Cause DLGDPCAP	93	0.78810	0.4579
DLGDPCAP does not Granger Cause DCPI		3.82426	0.0256
DPOPGR does not Granger Cause DLGDPCAP	93	2.06736	0.1326
DLGDPCAP does not Granger Cause DPOPGR		1.67692	0.1929
DCPI does not Granger Cause DIR_SH	93	0.85636	0.4282
DIR_SH does not Granger Cause DCPI		1.33676	0.2680
DPOPGR does not Granger Cause DIR_SH	93	0.36412	0.6958
DIR_SH does not Granger Cause DPOPGR		0.33691	0.7149

DPOPGR does not Granger Cause DCPI	93	2.26620	0.1097
DCPI does not Granger Cause DPOPGR		0.16260	0.8502

Table 2.6.
Pairwise Granger Causality test for Denmark.

Sample: 1927 2021
Lags: 2

Null Hypothesis:	Obs.	F-Statistic	Prob.
DLGDPCAP does not Granger Cause DN_RETURNS	93	3.71115	0.0284
DN_RETURNS does not Granger Cause DLGDPCAP		0.50304	0.6064
DIR_SH does not Granger Cause DN_RETURNS	93	2.58758	0.0809
DN_RETURNS does not Granger Cause DIR_SH		7.38530	0.0011
DCPI does not Granger Cause DN_RETURNS	93	0.64040	0.5295
DN_RETURNS does not Granger Cause DCPI		1.89163	0.1569
DPOPGR does not Granger Cause DN_RETURNS	93	2.36128	0.1002
DN_RETURNS does not Granger Cause DPOPGR		0.44617	0.6415
DIR_SH does not Granger Cause DLGDPCAP	93	0.30428	0.7384
DLGDPCAP does not Granger Cause DIR_SH		1.15168	0.3208
DCPI does not Granger Cause DLGDPCAP	93	9.25918	0.0002
DLGDPCAP does not Granger Cause DCPI		2.60884	0.0793
DPOPGR does not Granger Cause DLGDPCAP	93	0.42177	0.6572
DLGDPCAP does not Granger Cause DPOPGR		1.07097	0.3471
DCPI does not Granger Cause DIR_SH	93	0.29401	0.7460
DIR_SH does not Granger Cause DCPI		0.12803	0.8800
DPOPGR does not Granger Cause DIR_SH	93	2.33328	0.1029
DIR_SH does not Granger Cause DPOPGR		0.67144	0.5136
DPOPGR does not Granger Cause DCPI	93	0.17399	0.8406
DCPI does not Granger Cause DPOPGR		2.21896	0.1148

Appendix A 3.
Cointegration test.

Table 3.1.
Testing residuals for unit root in three data sets.

Switzerland				
Variable	Probability t-statistics (ADF)	Critical Values 1% level of significance	Critical Values 5% level of significance	Probability
Resid-Swiss	-11.11596	-3.502238	-2.892879	**0.0001***
Sweden				
Variable	Probability t-statistics (ADF)	Critical Values 1% level of significance	Critical Values 5% level of significance	Probability
Resid-Sweden	-11.13024	-3.502238	-2.892879	**0.0001***
Denmark				
Variable	Probability t-statistics (ADF)	Critical Values 1% level of significance	Critical Values 5% level of significance	Probability
Resid-Denmark	-9.863267	-3.502238	-2.892879	**0.0000***

Appendix A 4.
VECM Model Results for Switzerland, Sweden and Denmark.

Table 4.1.
VECM Model Results for Switzerland.

Vector Error Correction Estimates
Date: 06/28/22 Time: 00:26
Sample (adjusted): 1930 2021
Included observations: 92 after adjustments
Standard errors in () & t-statistics in [ ]

Error Correction:	D(DN RET…	D(DIR_SH)	D(DPOPGR)	D(DLGDPC…	D(DCPI)
CointEq1	-2.447873 (0.28741) [-8.51698]	2.542345 (1.86498) [1.36321]	1.245264 (0.44244) [2.81455]	0.068704 (0.01763) [3.89612]	-1.870674 (2.92597) [-0.63933]
CointEq2	0.018418 (0.03640) [0.50598]	-1.512229 (0.23620) [-6.40229]	0.019879 (0.05604) [0.35477]	0.000710 (0.00223) [0.31777]	-0.031045 (0.37058) [-0.08378]
CointEq3	-0.126891 (0.11508) [-1.10261]	1.694242 (0.74676) [2.26880]	-1.027351 (0.17716) [-5.79910]	0.005928 (0.00706) [0.83962]	0.704706 (1.17159) [0.60149]
CointEq4	-1.282128 (0.30675) [-4.17968]	3.934164 (1.99048) [1.97649]	0.293354 (0.47221) [0.62123]	-0.040894 (0.01882) [-2.17282]	-15.70708 (3.12288) [-5.02968]
D(DN_RETURNS(-1))	0.807894 (0.21627) [3.73552]	1.459928 (1.40337) [1.04030]	0.911026 (0.33293) [1.36321]	0.034719 (0.01327) [2.61649]	1.901137 (2.20176) [0.86346]
D(DN_RETURNS(-2))	0.235331 (0.12218) [1.92614]	-0.693959 (0.79279) [-0.87533]	0.400652 (0.18808) [2.13023]	-0.013165 (0.00750) [-1.75631]	1.119391 (1.24382) [0.89996]
D(DIR_SH(-1))	-0.016900 (0.02698) [-0.62629]	0.407679 (0.17510) [2.32828]	-0.026493 (0.04154) [-0.63778]	0.000267 (0.00166) [0.16104]	0.246976 (0.27471) [0.89903]
D(DIR_SH(-2))	-0.014066 (0.01832) [-0.76782]	0.099095 (0.11887) [0.83363]	-0.017560 (0.02820) [-0.62268]	0.000505 (0.00112) [0.44939]	0.080394 (0.18650) [0.43107]
D(DPOPGR(-1))	0.172082 (0.09085) [1.89404]	-1.374402 (0.58954) [-2.33130]	0.146800 (0.13986) [1.04962]	-0.005098 (0.00557) [-0.91451]	-0.701057 (0.92494) [-0.75795]
D(DPOPGR(-2))	0.017923 (0.07198) [0.24902]	-1.278511 (0.46704) [-2.73746]	0.059353 (0.11080) [0.53568]	-0.005926 (0.00442) [-1.34199]	0.012488 (0.73275) [0.01704]
D(DLGDPCAP(-1))	-0.137366 (1.70396) [-0.08062]	0.545984 (11.0568) [0.04938]	1.046548 (2.62306) [0.39898]	0.755436 (0.10455) [7.22590]	-44.18992 (17.3471) [-2.54740]
D(DLGDPCAP(-2))	-2.956976 (1.80437) [-1.63879]	-2.617489 (11.7083) [-0.22356]	0.343428 (2.77763) [0.12364]	0.267242 (0.11071) [2.41398]	3.770119 (18.3693) [0.20524]
D(DCPI(-1))	0.026823 (0.01755) [1.52879]	-0.043267 (0.11385) [-0.38004]	0.034226 (0.02701) [1.26722]	0.002210 (0.00108) [2.05279]	0.299184 (0.17862) [1.67500]
D(DCPI(-2))	0.014989 (0.01177) [1.27371]	0.004171 (0.07636) [0.05462]	0.020523 (0.01812) [1.13289]	-8.14E-O5 (0.00072) [-0.11274]	0.080931 (0.11981) [0.67552]
R squared	0.795459	0.614930	0.544445	0.589372	0.549935
Adj. R squared Suma sq.resids	0.761369 3.450989	0.550751 145.3058	0.468519 8.177878	0.520934 0.012991	0.474924 357.6651
S.E. equation	0.210341	1.364879	0.323797	0.012905	2.141366
F statistic	23.33402	9.581568	7.170743	8.611762	7.331406
Log likelihood	20.48153	-151.5667	-19.20597	277.2616	-193.0015

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Akaike AIC	-0.140903	3.599277	0.721869	-5.723079	4.500033
Schwarz SC	0.242848	3.983027	1.105619	-5.339329	4.883784
Mean dependent	0.004271	-0.000552	0.000639	-0.000231	0.025084
S.D. dependent	0.430587	2.036342	0.444149	0.018645	2.955153

Table 4.2.
VECM Model Results for Sweden.

Vector Error Correction Estimates
Date: 06/28/22 Time: 01:14
Sample (adjusted): 1930 2021
Included observations: 92 after adjustments
Standard errors in () & t-statistics in []

Error Correction:	D(DN RET...	D(DLGDPC...	D(DIR_SH)	D(DCPI)	D(DPOPGR)
CointEq1	-2.367886 (0.30930) [-7.65551]	0.057109 (0.01557) [3.66698]	1.955852 (1.49949) [1.30434]	1.025630 (3.36377) [0.30490]	0.154310 (0.15578) [0.99055]
CointEq2	0.028938 (0.35860) [0.08070]	-0.011268 (0.01806) [-0.62408]	-6.525278 (1.73849) [-3.75342]	15.41750 (3.89990) [3.95331]	-0.126544 (0.18061) [-0.70064]
CointEq3	-0.028589 (0.04907) [-0.58265]	-0.002324 (0.00247) [-0.94072]	-0.925048 (0.23787) [-3.88886]	0.918612 (0.53361) [1.72150]	-0.012239 (0.02471) [-0.49525]
CointEq4	0.003859 (0.02048) [0.18839]	-0.001618 (0.00103) [-1.56872]	0.044259 (0.09931) [0.44569]	-1.742847 (0.22277) [-7.82351]	-0.004260 (0.01032) [-0.41289]
D(DN_RETURNS(-1))	0.764430 (0.23740) [3.21998]	0.029833 (0.01195) [2.49576]	1.264672 (1.15091) [1.09884]	0.205140 (2.58181) [0.07946]	0.111849 (0.11957) [0.93544]
D(DN_RETURNS(-2))	0.201096 (0.13487) [1.49104]	0.018105 (0.00679) [2.66608]	0.475810 (0.65384) [0.72771]	1.089865 (1.46675) [0.74305]	0.001024 (0.06793) [0.01507]
D(DLGDPCAP(-1))	0.368808 (2.13036) [0.17312]	0.470820 (0.10727) [4.38923]	7.554244 (10.3279) [0.73144]	10.21505 (23.1683) [0.44091]	1.962013 (1.07296) [1.82860]
D(DLGDPCAP(-2))	2.954560 (2.13344) [1.38488]	0.396176 (0.10742) [3.68804]	3.857769 (10.3428) [0.37299]	20.70657 (23.2017) [0.89246]	0.086066 (1.07451) [0.08010]
D(DIR_SH(-1))	0.047094 (0.03733) [1.26159]	0.000803 (0.00188) [0.42739]	-0.104807 (0.18097) [-0.57915]	-0.405496 (0.40596) [-0.99886]	0.004887 (0.01880) [0.25993]
D(DIR_SH(-2))	0.005292 (0.02583) [0.20486]	0.000389 (0.00130) [0.29879]	0.196541 (0.12523) [1.56939]	0.385151 (0.28093) [1.37096]	0.008209 (0.01301) [0.63098]
D(DCPI(-1))	0.006847 (0.01506) [0.45456]	0.000813 (0.00076) [1.07156]	0.011826 (0.07302) [0.16196]	0.598885 (0.16380) [3.65612]	0.000537 (0.00759) [0.07076]
D(DCPI(-2))	0.007061 (0.00959) [0.73662]	0.000579 (0.00048) [1.20062]	0.045760 (0.04647) [0.98467]	0.298068 (0.10425) [2.85918]	0.000205 (0.00483) [0.04244]
D(DPOPGR(-1))	0.115979 (0.26594) [0.43612]	0.000288 (0.01339) [0.02153]	0.727968 (1.28924) [0.56465]	3.959512 (2.89212) [1.36907]	0.310290 (0.13394) [2.31665]
D(DPOPGR(-2))	0.105970 (0.24059) [0.44046]	0.014909 (0.01211) [1.23070]	0.182813 (1.16638) [0.15674]	2.312958 (2.61650) [0.88399]	0.109043 (0.12117) [0.89988]
R squared	0.786444	0.514344	0.590631	0.688171	0.431978
Adj. R squared	0.750852	0.433402	0.522403	0.636199	0.337308
Suma sq.resids	4.665833	0.011829	109.6591	551.8335	1.183557
S.E. equation	0.244578	0.012315	1.185701	2.659847	0.123182

F statistic	22.09572	6.354432	8.656701	13.24129	4.562969
Log likelihood	6.607673	281.5706	-138.6194	-212.9494	69.70781
Akaike AIC	0.160703	-5.816751	3.317813	4.933683	-1.211039
Schwarz SC	0.544453	-5.433001	3.701564	5.317433	-0.827289
Mean dependent	-0.000180	-0.000358	0.001033	0.028976	0.000855
S.D. dependent	0.489991	0.016360	1.715711	4.409860	0.151318
Determinant resid covariance (dof adj.)			9.57E-07		
Determinant resid covariance			4.19E-07		
Log likelihood			22.79220		
Akaike information criterion			1.461039		
Schwarz criterion			3.928006		
Number of coefficients			90		

Table 4.3.
VECM Model Results for Denmark.

Vector Error Correction Estimates
Date: 06/28/22 Time: 01:27
Sample (adjusted): 1930 2021
Included observations: 92 after adjustments
Standard errors in () & t-statistics in []

Error Correction:	**D(DN RET…**	**D(DLGDPC…**	**D(DIR_SH)**	**D(DCPI)**	**D(DPOPGR)**
CointEq1	-2.013033 (0.29629) [-6.79409]	0.057863 (0.02448) [2.36385]	0.437346 (1.63640) [0.26726]	1.237852 (3.93017) [0.31496]	0.071720 (0.12277) [0.58416]
CointEq2	-0.343819 (0.57169) [-0.60141]	-0.036778 (0.04723) [-0.77869]	-2.913196 (3.15738) [-0.92266]	-2.253482 (7.58314) [-0.29717]	-1.126239 (0.23689) [-4.75427]
CointEq3	0.001832 (0.03633) [0.05044]	-0.001285 (0.00300) [-0.42820]	-0.926723 (0.20063) [-4.61902]	0.286026 (0.48186) [0.59359]	-0.006504 (0.01505) [-0.43209]
CointEq4	0.004157 (0.01796) [0.23144]	-0.001918 (0.00148) [-1.29278]	-0.009055 (0.09919) [-0.09128]	-1.549097 (0.23824) [-6.50235]	-0.003146 (0.00744) [-0.42265]
D(DN_RETURNS(-1))	0.512813 (0.21935) [2.33790]	0.039995 (0.01812) [2.20705]	1.106599 (1.21144) [0.91346]	0.758447 (2.90953) [0.26068]	0.046910 (0.09089) [0.51612]
D(DN_RETURNS(-2))	0.025723 (0.12953) [0.19858]	0.021356 (0.01070) [1.99560]	1.135224 (0.71541) [1.58682]	0.782509 (1.71822) [0.45542]	0.005656 (0.05368) [0.10537]
D(DLGDPCAP(-1))	0.677342 (1.44845) [0.46763]	0.795923 (0.11966) [6.64960]	6.612406 (7.99967) [0.82659]	14.44573 (19.2130) [0.75187]	0.215385 (0.60019) [0.35886]
D(DLGDPCAP(-2))	1.983041 (1.42142) [1.39512]	0.421048 (0.11743) [3.58548]	11.77779 (7.85036) [1.50029]	16.34799 (18.8544) [0.86707]	0.860696 (0.58899) [1.46130]
D(DIR_SH(-1))	0.023477 (0.02949) [0.79603]	0.000772 (0.00244) [0.31667]	-0.087213 (0.16289) [-0.53543]	-0.147974 (0.39121) [-0.37825]	0.002437 (0.01222) [0.19942]
D(DIR_SH(-2))	0.020953 (0.02153) [0.97340]	-0.000733 (0.00178) [-0.41227]	0.024416 (0.11889) [0.20538]	0.023318 (0.28553) [0.08166]	0.003329 (0.00892) [0.37319]
D(DCPI(-1))	-0.000749 (0.01264) [-0.05925]	-0.001076 (0.00104) [-1.03051]	0.010586 (0.06983) [0.15160]	0.509500 (0.16772) [3.03786]	0.004729 (0.00524) [0.90269]
D(DCPI(-2))	-0.003967 (0.00830) [-0.47801]	-0.000835 (0.00069) [-1.21774]	0.004592 (0.04583) [0.10020]	0.136887 (0.11007) [1.24360]	0.001850 (0.00344) [0.53808]
D(DPOPGR(-1))	0.021012 (0.35150)	0.000689 (0.02904)	2.507277 (1.94133)	3.031602 (4.66254)	0.126947 (0.14565)

	[0.05978]	[0.02372]	[1.29152]	[0.65020]	[0.87157]
D(DPOPGR(-2))	0.301651 (0.26919) [1.12057]	0.003255 (0.02224) [0.14636]	0.490181 (1.48674) [0.32970]	6.389871 (3.57073) [1.78952]	0.035528 (0.11155) [0.31850]
R squared	0.781444	0.480924	0.660203	0.638012	0.487125
Adj. R squared Suma sq.resids	0.745018 4.075944	0.394412 0.027820	0.603571 124.3269	0.577681 717.1502	0.401646 0.699852
S.E. equation	0.228595	0.018886	1.262511	3.032199	0.094723
F statistic	21.45294	5.559007	11.65762	10.57514	5.698758
Log likelihood	12.82522	242.2323	-144.3941	-225.0032	93.87673
Akaike AIC	0.025539	-4.961571	3.443351	5.195722	-1.736451
Schwarz SC	0.409289	-4.577820	3.827102	5.579472	-1.352700
Mean dependent	0.001185	-0.000191	-0.003143	0.026438	0.000702
S.D. dependent	0.452702	0.024268	2.005176	4.665920	0.122455
Determinant resid covariance (dof adj.)			1.45E-06		
Determinant resid covariance			6.35E-07		
Log likelihood			3.713997		
Akaike information criterion			1.875783		
Schwarz criterion			4.342750		
Number of coefficients			90		