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The Relationship between Inflation and Stock Returns in a Small Island State: An Analysis

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Abstract:

Purpose: *This article lays out an analysis of the relationship between inflation and Maltese monthly stock returns, comprising of 139 observations.*
Design/Methodology/Approach: *A series of statistical tests were used so that the final multivariate time series model – a Vector Error Correction Model, was fitted to the data. The model results were corroborated to the findings from the qualitative data and previous empirical evidence.*
Findings: *Findings indicate that stock returns are positively influenced by the previous month's returns and negatively influenced by inflation, where the latter factor takes 3 to 4 months to impact stock returns. Additionally, short-term interest rates and money supply seem to contribute indirectly to the negative inflation-stock returns relationship since both variables are statistically significant in explaining inflation. Long-term interest rates and industrial production variables are statistically insignificant in explaining both inflation and stock returns. Findings show that Maltese investors' focus is on high dividend pay-out and capital preservation.*

Keywords: *Maltese Stock Market, Stock Returns, Multivariate Time Series Model, Macroeconomic Finance*

JEL Classification: *E31, P24, P44*

Paper type: *Research article.*

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1. Introduction

Inflation imposes a threat to investors since it takes away real savings and investment returns. Generally, investors strive to raise their long-term purchasing power. Inflation restrains such objective since for real purchasing power to increase, investment returns must first sustain the rate of inflation. Despite this, real returns on assets are typically low. Therefore, investing in stocks becomes more attractive for investors since they will enjoy the equity premium, but the drawback is that stocks are also subject to inflation risk. For this reason, identifying and understanding the relationship between inflation and stock returns is crucial.

"Inflation refers to a general rise in the level of prices throughout the economy" (Sloman and Wride 2009). Inflation is normally driven by a surge in money supply or increases in the cost of production. It contributes to expansion of the economy because if inflation for the next year is expected to increase, then individuals or organizations are motivated to purchase sooner. However, when inflation increases, it can be detrimental to an economy because it generates low growth and greater unemployment (Stanlake and Grant 2000). Stock returns quantify the worth that shareholders gain against the amount paid for the initial equity investment. Stock returns are influenced by every element that affects the total demand and total supply of an economy. These elements consist of inflation, real interest rates and real activity level amongst others (Mishkin *et al.*, 2013).

In this article, we aim to lay out our investigation of the relationship between inflation and stock returns by applying a mixed method approach of quantitative and qualitative analysis to:

a. establish a relationship between these two variables in the context of a small island state (specifically, Malta) market;
b. investigate the causes of such relationship.

The inflation-stock returns relationship is a concern for both investors and policy makers. For the former, a better understanding of such a relationship will help investors identify whether stock returns provide protection against inflation (positive relationship) or not (negative relationship). For the latter, a better understanding ensures the implementation of the right strategies to limit inflation and enhance economic growth. In this study we sought to:

(i) identify links between inflation and stock returns from previous studies and assess if these can be applied to the economic scenario of a small island state;
(ii) evaluate the relationship between stock returns and inflation in Malta between January 2008 and July 2019 with the purpose of establishing the origin of the negative relationship;
(iii) interpret the inverse relationship between inflation and Maltese stock returns with previous empirical evidence from developed and developing economies.

2. Literature Review

There are two theories, which describe the inflation-stock returns relation, the first claims that inflation is positively related to stock returns (Danthine and Donaldson, 1986; Fisher, 1930; Kim and Ryoo, 2011) whilst the second argues that inflation is negatively related to stock returns (Bodie, 1976; Fama, 1981; Fama and Schwert, 1977; Kaul, 1987; Marshall, 1992; Modigliani and Cohn, 1979).

The positive relationship arises from the Fisher (1930) hypothesis, which states that the nominal interest rate, less expected inflation will result in the real interest rate.

$$\therefore i_r = i - \pi \quad (1)$$

where;

i_r = the real interest rate,
i = the nominal interest rate,
π = the expected inflation rate.

This was extended further and the theoretical foundation for the positive relationship between stock returns and inflation originated. The extended Fisher (1930) hypothesis presumes that nominal interest rates consist of a real element along with an inflationary element. Consequently, a rise in expected inflation would bring about a rise in the interest rate given that the real interest rate remains constant (Mishkin *et al.,* 2013). This theory has been extended from interest rates to all financial assets. This implies that the nominal return on an asset (for example, equity), contains an element of inflation and a real return. In principle, a rise in inflation should be equivalent to a one-to-one rise in the inflationary element of the asset's return and in the asset's concerned total return (Fisher, 1930). Therefore, in this regard, the inflation-stock returns relation can be presumed to be positive.

Furthermore, Kim and Ryoo (2011) who examined whether the long run-relationship between stock prices and goods prices is a requisite for equity shares to provide an effective hedge against inflation, concluded that stock returns are an effective long-run hedge against inflation which is in line with the Fisher (1930) hypothesis.

Bodie (1976) described the extent to which common stocks may be used as a hedge against inflation. This study examined the degree to which common stocks may be used to decrease the risk of an investor's real return, which arises from uncertainty on the expected level of consumption prices. The study concluded that in the short run there is a negative correlation between real return on equity and both expected and unexpected inflation (Bodie, 1976).

Fama's (1981) study was centered around the fact that the adverse relationship between inflation and real activity is the answer to the factitious negative relationship between stock returns and inflation, given that inflation is triggered by real activity. This is known as the proxy-effect hypothesis meaning that stock returns are established by predictions of variables which are more closely related, and the negative stock returns-inflation correlations are generated by adverse real activity-inflation relations (Fama, 1981).

Balduzzi (1995) re-examined Fama's (1981) hypothesis by using quarterly data, also concluded a negative inflation-stock returns relation and derived that inflation drives most of the fluctuations in stock returns. However, the study also deduced that interest rates function as a better 'proxy' than real activity to justify the negative inflation-stock returns relation. Therefore, short-term interest rates might be key in driving the inflation-stock returns relation (Balduzzi, 1995). Furthermore, several authors have recognized that the relationship between inflation and stock returns is determined by the source of inflation, that is, whether it arises from demand or supply factors (Geske and Roll, 1983; Lee, 1989). Based on equilibrium models, the relationship between inflation and stock returns is mainly influenced by two elements:

1. Demand shocks such as monetary (Tobin, 1969) and fiscal policy shocks.
2. Supply shocks including shocks in oil price and shocks in productivity.

Thus, it can be deduced that the stock return-inflation relation differs according to the cause of inflation (Hess and Lee 1999; Lee 2010).

Danthine and Donaldson (1986), Stulz (1986) and Marshall (1992) established general equilibrium models that, contrary to the Fisher hypothesis, expect stocks to be unable to provide an effective hedge against inflation particularly when inflation is triggered by non-monetary factors (for example, real output shocks). Money is introduced in the model as an asset that offers transaction services, and its price is established together with stocks. Anticipation of an increase in the price levels, decreases the purchasing power of money and hence wealth decreases. Consecutively, the anticipated real return on stocks declines. Their findings showed that stocks provide an effective hedge against a purely monetary inflation but are unable to offer protection to reduce the impact of inflation caused by real output shocks.

Modigliani and Cohn's (1979) inflation illusion hypothesis asserts that in an environment where inflation is increasing, interest rates are expected to increase and so investors start applying higher discount factors when calculating the present value of expected future earnings and dividends to compensate for the increase in interest rates. Hence, stock prices decrease since they are equivalent to the present value of expected future earnings. This justifies the negative inflation-stock returns relationship.

The Mundell-Tobin model ascribes a negative relationship between expected inflation and expected stock returns in relation to the money demand theory, in that, when interest rates and expected inflation are high, the greater the opportunity cost of holding money without interest. As a result, money-holders attempt to shift their holdings to financial assets, such as short-term bonds, to gain interest and protect themselves from higher expected inflation. This leads to lower expected real returns (such as equity). In turn, this decreases the cost-of-capital for investment decisions by companies as well as the public, thus inducing an increase in capital expenditure and real activity (Mundell 1963; Tobin 1965).

Additionally, Kaul (1987; 1990), based on earlier studies by Fama (1981) and Geske and Roll (1983), argued that the relationship between inflation and stock returns arises from the equilibrium process in the monetary sector. Equilibrium in the monetary sector occurs when "the quantity of money demanded equals the quantity of money supplied" (Mishkin *et al.,* 2013). Kaul (1987) suggested that inflation stimulates the economy's demand for money, which is met by withdrawing investments, thus resulting in lower stock returns. Moreover, Kaul (1987) stated that such relationship fluctuates over time in an orderly manner subject to the forces of money demand and supply factors (Geske and Roll, 1983; Lee, 1989).

Furthermore, Kaul (1990) deduced that the negative inflation-stock returns correlation varies across monetary regimes[5] – a stronger negative correlation during interest rate regimes in comparison to money supply regimes. Therefore, there seems to be a close correlation between the monetary policy of the Federal Reserve System and the stock returns-inflation relationship. Park and Ratti (2000) have continued to solidify this significant role of the counter-cyclical monetary policy in justifying the negative inflation-stock returns relation.

Li *et al.* (2010) investigated the inflation-stock returns relation in the short-run and medium-run and under various inflationary regimes by utilizing UK statistics. The study concluded that in the short-term a significant negative relationship is evident between unexpected inflation and stock returns whereas in the case of expected inflation the relationship is not significant. On the other hand, in the medium-term conflicting outcomes were obtained. This implies that stock returns are positively correlated with expected inflation (Fisher, 1930), but they are negatively related with unexpected inflation (Fama, 1981). Furthermore, it was found that different inflationary regimes (i.e., low, stable, or high inflation) affect investment choices and so they have significant impact on the stock returns relations because they affect investment choices (Li *et al.*, 2010).

Another strand of literature found an adverse correlation between inflation and stock returns during recessionary periods only. It also confirmed that empirically real stock returns respond in a different manner towards inflation in a "regime-dependent proxy effect hypothesis", these being either an economic boom or recession (Cifter, 2015; p. 70). The results obtained showed that the controversy concerning the stock returns-inflation relation in previous studies "can be explained with the regime-dependency between real stock returns, inflation and real activity" (Cifter, 2015, p. 73).

[5] *Monetary regimes in Kaul's (1990) article refers to two types that is interest rate control regime and money supply control regime.*

Yuhn *et al.* (2018) attempted to present a solid interpretation for the relationship between inflation and stock returns in an inter-temporal portfolio-choice framework. The study denoted that in a time of lower inflation volatility, real stock returns are likely to have a negative correlation with expected inflation; whereas in a time of high inflation volatility, expected stock returns and inflation are positively correlated. Furthermore, it was statistically proven that when the standard deviation of the annual inflation rate is equivalent to 10% or greater, the relationship between expected inflation and stock returns is positive whereas when the standard deviation of the annual inflation rate is below 10%, then the stock returns-inflation relation is negative (Yuhn *et al.*, 2018).

2.1 Inflation-Stock Returns Relation in Developed and Developing Economies

A study carried out by Gultekin (1983) concluded that most countries do not satisfy the Fisher (1930) hypothesis, stating that only Israel and the United Kingdom (UK) displayed statistically positive estimates of the inflation coefficient. The findings also indicated that some of the industrialized countries, including Germany, Italy, and Switzerland, have a negative relationship between inflation and stock returns. On the contrary, many of the other industrialized countries, including Australia, Canada, Denmark, Japan, Spain, and the US have a weak negative relationship between the two variables (Gultekin, 1983). This was corroborated by Paul and Mallik (2003) for Australia.

Erb *et al.* (1995) in their study of 41 countries, established that generally, a negative relationship only prevails in a time series analysis. Whereas in a cross-sectional analysis, the Fisher hypothesis is supported across different countries. Similarly, Boyd et al. (2001) identified a negative relationship between inflation and stock returns but only in countries experiencing low-inflation rates. Whilst when analyzing high-inflation countries, stock returns were found to increase one-for-one with minor increases in inflation (Boyd *et al.*, 2001).

Lin (2009) examined the relationship between inflation and stock returns by focusing on 16 industrialized OECD[6] countries, namely Australia, France, Germany, Italy, Japan, Norway, Spain, United Kingdom and United States, amongst others for the period 1957 to 2000. The study found that expected inflation and inflation uncertainty have an insignificant impact on real stock returns in the short-run, but a significant and negative impact on real stock returns in the long-run. With respect to unexpected inflation, the study concluded that there is a co-existence of a negative long-run impact and a positive short-run impact of unexpected inflation on real stock returns (Lin, 2009). Hence, this suggests that in terms of expected inflation, the Fisher (1930) effect seems to hold in the short run only.

[6] *OECD: Organization for Economic Co-operation and Development.*

Geetha *et al.* (2011) found a long-run relationship between stock returns and both expected and unexpected inflation for China, Malaysia, and United States. However, there seems to be no short-run relationship between these variables for Malaysia and US as opposed to China (Geetha *et al.*, 2011).

Furthermore, Khan and Yousuf (2013) investigated the impact of several macroeconomic variables including inflation, interest rates and broad money supply on stock returns in Bangladesh using co-integration analysis and a Vector Error Correction Model (VECM). The study concluded that inflation does not affect stock prices in the long-term whilst interest rates and money supply are positively correlated to stock prices (Khan and Yousuf, 2013). On the contrary, Rushdi *et al.* (2012) who studied the long-run correlation between real stock returns and inflation in Australia found a significant and negative relationship between inflation and stock returns, when actual inflation was modelled. However, when inflation was expected, this study agrees with Khan and Yousuf (2013) implying that no significant relationship between inflation and stock returns was found. Hence, the latter suggesting that in Australia, common stocks can be adequately used as a hedging tool against expected inflation (Rushdi *et al.*, 2012).

Ferrer *et al.* (2016) who investigated the link between 10-year government bond yields and stock returns for several European countries, found that these two variables differ significantly from one country to another, and their relationship varies over time with respect to the time horizon considered. For instance, in the UK there is most interdependence between long-term interest rates and equity returns across time and frequencies, in times of uncertainty such as the recent global financial crises in 2007-2009. Furthermore, the significant link between fluctuations in 10-year government bond yields and equity returns is mostly strong at investment horizons from one to two years, whilst for horizons less than a month and a half the link is very weak. The study deduced a negative relationship between long-term interest rates and stock returns until the late-1990s whilst a positive relationship since the early 2000 onwards. Moreover, a positive relationship was found for Germany, France, The Netherlands, and Finland. In such countries the link between long-term interest rates and inflation was stronger when the global financial crisis commenced in 2007. This positive relationship highlights that the historically low levels of interest rates in recent years have been unable to stimulate European stock markets. Whilst for other European countries including Portugal, Ireland and Greece, the relationship is much weaker. Ferrer *et al.* (2016) argued that this weak link may be because the stock markets of these countries are illiquid and have a relatively small capitalization.

Consistent with the Fisher (1930) hypothesis, Gultekin (1983) concluded that fluctuations in short-term interest rates correspond to fluctuations in inflation rate since all regression coefficients were positive and significant for most countries. This was corroborated by Jonsson and Reslow (2015) who found a positive relationship between interest rates and inflation in all the six countries under study being Sweden, US, Euro area, Japan, UK, and Canada. On the contrary, Paul and Mallik (2003), for the case of Australia, found that interest rates affect stock prices negatively. A possible reason why the results contradict the Fisher (1930) hypothesis is due to measurement error which generates biased coefficient estimates (Fuller, 1987).

Several studies deduced that stock returns of several countries are influenced by real output shocks, that is industrial production and GDP. For instance, Australia (Paul and Mallik, 2003), Canada, Japan, Spain, Switzerland (Ely and Robinson, 1997) and Germany, Italy, and UK. Furthermore, stock prices were also found to be significantly correlated to short- and long-term interest rates amongst other macroeconomic variables (Nasseh and Strauss 2000).

Rahman *et al.* (2009) who studied the long-run effects of several macroeconomic variables (including money supply, inflation, and industrial production) on Malaysia's stock returns using a VECM framework, agreed with Fama's (1981) study. The study deduced that in the long-run industrial production index affects stock returns positively while money supply and interest rates affect stock returns negatively. This was also corroborated by Humpe and Macmillan (2007) for the case of Japan.

Additionally, this study investigated the relationship between US stock prices and several macroeconomic variables, and it found that US stock returns are positively related to industrial production and negatively related to inflation and long-term interest rates. Whilst an insignificant relationship between US stock prices and money supply was found (Humpe and Macmillan 2007).

Mukherjee and Naka (1995) whose study revolved around the Japanese stock market claimed that a rise in money supply will bring about economic expansion due to increased cash flows, stock prices would profit from economic growth driven by an expansionary monetary policy. This implied that money supply and Japanese stock returns are positively related (Mukherjee and Naka, 1995). This was also corroborated by Hasan and Nasir (2008) and Khan and Khan (2018) who analyzed the impact of several macroeconomic variables on Japanese stock returns. Despite this, in Japan (Hasan and Nasir 2008; Khan and Khan (2018) and in Pakistan (Hamao, 1988) the industrial production variable was found to be insignificant in explaining stock returns.

A recent study which investigated the inflation-stock returns relationship in Brazil, also found a negative relationship between the two. The study deduced that such relationship is caused by the vulnerability of the capital market in Brazil to capital flows. Furthermore, industrial production was found to influence stock returns negatively (Chaves and Silva, 2018).

3. Research Methodology

The research methodology adopted in this study consisted of a mixed methods research design applying both quantitative and qualitative data collection measures and analytical techniques. The study's objectives were primarily studied through the application of quantitative research with the qualitative component aiming to consolidate and seek views on the results of the former.

3.1 Data Collection

This study made use of secondary data, gathered from the period between January 2008 and July 2019 - comprising of monthly observations of each variable used in the models. These add up to a total of 139 observations. Table 1 below outlines the variables used:

Table 1. *Summary of Research variables*

Variable	Interpretation
$MSETRX_t$	Malta Stock Exchange Equity Total Return Index level for month t
$HICP_t$	Harmonised Index of Consumer Prices for month t
$TB3m_t$	Three-month Maltese Treasury bill rate for month t
$GB10y_t$	Ten-year Government Bond Yield for month t
$M3_t$	Broad Money for month t
IP_t	Index of Industrial Production level for month t

Source: *Own study.*

The data used in the study included primarily inflation (where HICP was used to source the data and was obtained from the NSO[7] website) and stock returns (which was obtained from the MSE Equity Total Return Index time series data (MSETRX[8])). These are the primary variables in this study. The additional variables used are, money supply which was represented by Broad Money (M3)[9] and was obtained from the Central Bank of Malta website under the table entitled 'The Contribution of Resident MFIs to Euro Area Monetary Aggregates', interest rates where the short-term interest rate, represented by three-month Treasury bill (TB3m), and long-term interest rate, represented by ten-year government bond (GB10y) both of which were sourced from the Central Bank of Malta website, were used; and lastly real activity which was represented by the Index of Industrial Production (IP)[10] and was compiled by using monthly data from the Eurostat database under the section "Short-term Statistics".

[7] *NSO is the National Statistics Office in Malta whose main priority is to produce top-quality statistics and analysis (NSO 2019).*
[8] *MSETRX is the Malta Stock Exchange Equity Total Return Index. Such data can be obtained from the Malta Stock Exchange which offers information on stock prices, indices, international markets and regulatory news service announcements (MSE 2019, 2020).*
[9] *M3 consists of M2[9] "plus repurchase agreements, money market fund shares/units and debt securities with an original maturity of up to 2 years" (Central Bank of Malta 2020a).*
[10] *IP is a monthly economic indicator calculating real output in the manufacturing, mining, and quarrying, electricity and gas industries in relation to a base year (NSO 2019).*

3.2 Quantitative Research

The principal methodology involved building a multivariate time series model[11]. A basic understanding of the nature of the data was obtained by calculating several descriptive measures such as the measures of central tendency (mean and median), the measures of dispersion (range, variance and standard deviation) and the coefficient of variation (which is the ratio of the standard deviation to the mean i.e. $\frac{\sigma}{\mu}$). Additionally, a plot of each variable against time helped to identify any patterns and general trends of the dataset and to establish 'a priori' expectations as well as gaining an understanding of whether the time series is stationary[12].

The model was developed by first testing each variable for stationarity by using the tau (τ) test whose critical values are based on the Monte Carlo simulations and is more commonly known as the Augmented Dickey-Fuller (ADF) test. The ADF test contains two tests for stationarity, one which tests for no constant and no trend and the other tests for a constant but no trend. In this study both tests are examined where the null hypothesis is defined as the presence of a unit root and so the variable is non-stationary, whereas the alternative hypothesis implies that there is no unit root and so the variable is stationary (Dickey and Fuller 1979).

Subsequently, the Granger-causality[13] test was applied to establish whether a variable can predict another variable. This test eventually led to the implementation of the vector autoregressive (VAR) model which analyzed the stock returns-inflation relation (Hamilton 1994). However, due to multicollinearity[14] (which is generally strong in time-series data), the VECM was fitted since in the error-correction form, the multicollinearity effect is significantly decreased implying that differences are more statistically independent (orthogonal). Moreover, the coefficients can be categorized into short-run and long-run effects. Therefore, estimates can be interpreted more easily. Hence, a VECM model was selected to analyze the objectives of this study.

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[11]*A multivariate time series model is one which considers multi-period values simultaneously (Tsay 2014).*

[12]*Stationarity is a statistical property indicating that the time series does not change over time (Gujarati, Porter 2010).*

[13]*Granger-causality test is a statistical hypothesis test which analyses whether one variable* (y) *is able to predict another variable* (x)*. If it cannot, then it is deduced that* y *fails to Granger-cause* x *for all* $t < 0$*. On the contrary if, the lagged values of* x *and* y *together are better in explaining* x *as opposed to when using only lagged values of* x *itself, then,* y *is assumed to Granger-cause* x *(Hamilton 1994).*

[14]*Multicollinearity is a common issue in time series data and arises when the explanatory variables are related to one another and as a result a unique estimate of all parameters cannot be obtained leading to unreliable and unstable estimates of coefficients. Therefore, the interpretability of the model is lost (Gujarati, Porter 2010).*

The VECM does not require the time series variables to be stationary but allows non-stationarity provided that the variables are cointegrated (Juselius 2006). Hence, prior to fitting the VECM, the time series was checked for cointegration[15] and given that the time series was cointegrated, a VECM model of the following form was fitted:

$$\Delta x_t = \Gamma_1^{(m)} \Delta x_{t-1} + \Gamma_2^{(m)} \Delta x_{t-2} + \cdots + \Gamma_{k-1}^{(m)} \Delta x_{t-k+1} + \Pi x_{t-m} + \Phi D_t + \varepsilon_t \qquad (2)$$

where;
Δx_t= the first difference of the variables in vector x at time t,
Γ = a coefficient matrix of the lags of differenced variables of x,
m = an integer between 1 and k defining the lag placement of the ECM term,
$\Pi = \alpha\beta'$; where α is a loading matrix describing the speed at which a dependent variable converges back to its equilibrium value and β' is the cointegration matrix. Hence, Π is a coefficient matrix of cointegrating relationships (r) and represents the cointegrating rank of the VECM (i.e., it influences the number of error correction terms needed).
D_t= a vector of deterministic terms at time t,
Φ= the coefficient matrix of D_t,
ε_t= an error term which is normally distributed with constant covariance (Juselius 2006).

After estimating the VECM, a robustness check was carried out by conducting misspecification tests which included checking the multivariate normality assumption underlying the model as well as serial correlation of the residuals (ε_t).

The VECM was built using the Statistical Package for Social Sciences (SPSS) analysis software for descriptive statistics and R programming language to carry out the statistical tests and generate the final model.

3.3 Qualitative Research

The qualitative research approach involved the acquisition of primary qualitative data through 8 semi-structured interviews with stockbrokers, financial analysts, and economists. Qualitative saturation was reached at 6 interviews when similar responses were being received therefore, we decided to continue for another 2 interviews to ensure that no added value could be received from a new interview.

4. Research Findings and Discussion

4.1 Research Findings

[15] *Cointegration analysis "identifies stationary linear combinations between non-stationary variables so that an I(1) model can be reformulated exclusively in stationary variables" (Juselius 2006, p.82).*

Descriptive Statistics: Table 2 presents descriptive statistics for the variables used in the model. The results indicate that the data is symmetrical since the mean and median are similar. The significantly high standard deviation relative to the mean of MSETRX and M3 indicates a greater spread in the data and hence the values in the dataset are, on average, further away from the mean. The coefficient of variation shows the level of dispersion around the mean. All coefficients of variation are less than ten, and it can be concluded that the values in the dataset give a precise estimate, with the short-term interest rates being the most volatile.

Table 2. *Descriptive Statistics*

	MSETRX	HICP	TB3m	GB10y	M3	IP
Mean	6,691.24	1.90	0.81	2.91	13,527.77	103.52
Median	6,053.76	1.40	0.48	3.21	11,834.98	102.20
Minimum	4,137.93	-0.50	-0.38	0.52	8,583.08	89.30
Maximum	9,815.91	5.70	4.94	5.28	20,769.23	126.70
Range	5,677.98	6.20	5.32	4.76	12,186.15	37.40
Variance	2,558,927	1.75	1.62	2.26	17,034,635	49.93
Standard Deviation	1,599.66	1.32	1.27	1.50	4,127.30	7.07
Coefficient of Variation	0.239	0.70	1.56	0.52	0.305	0.068

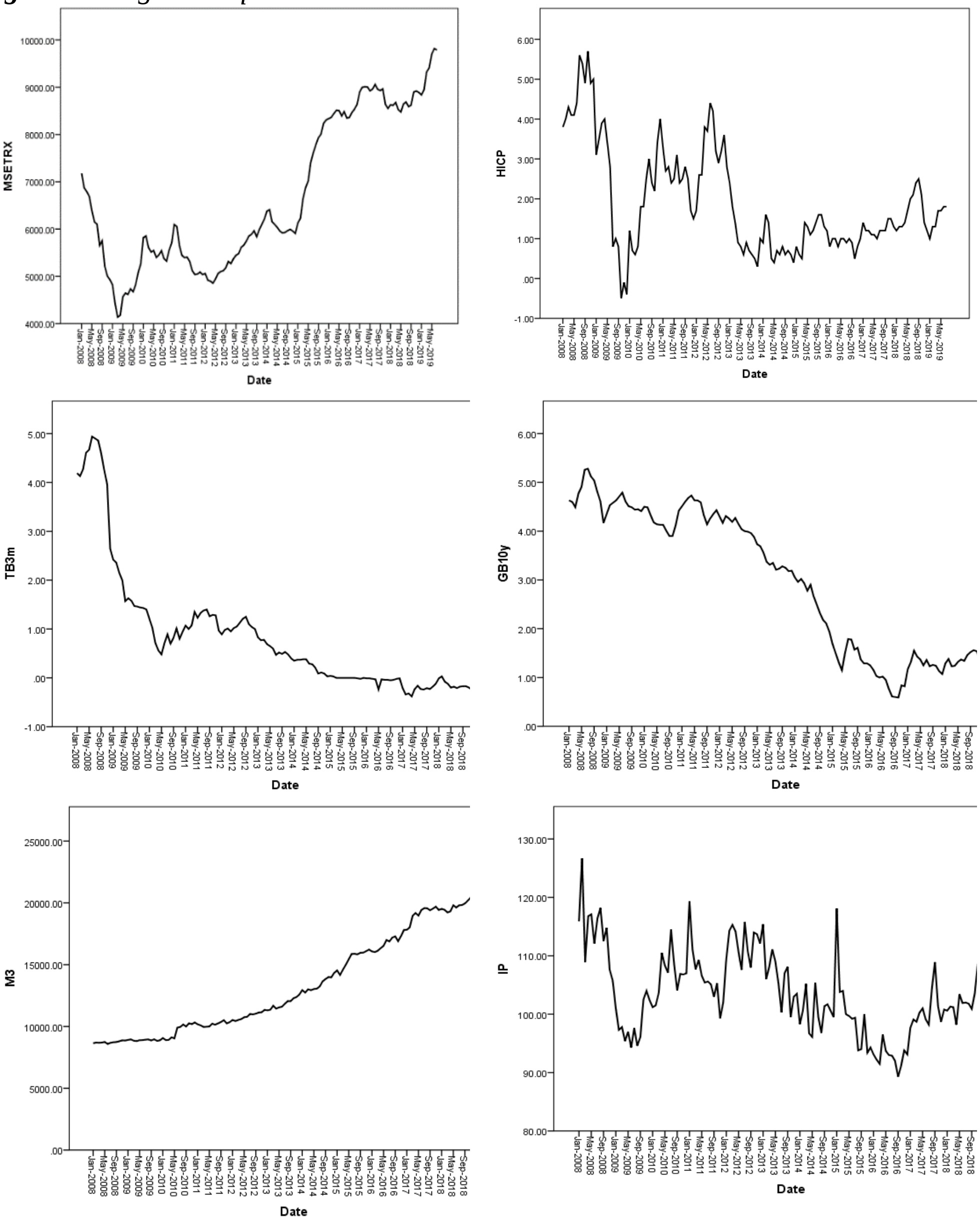
Source: *Own study.*

Original Sequence Plots: Figure 1 overleaf shows each variable plotted against time where the volatility of MSETRX, HICP and IP is highlighted and matches ‘a priori’ expectations. TB3m and GB10y show a declining path implying that interest rates are decreasing over the years, whilst M3 shows an upward trend over the years. Figure 1 also illustrates strong evidence of non-stationarity in all the time series. This was corroborated via unit root tests explained below.

4.2 Stationarity

The first statistical test was to analyze whether each time series variable is non-stationary (unit root test) or otherwise. Table 3 shows the results from the ADF test for each variable. From the above differenced sequence plots, it was demonstrated that with first-order differencing, all-time series become stationary. As a result, the lag order in the ADF test was set at 1.

Figure 1. *Original Sequence Plots*



Source: *Own study.*

From Table 3, it can be deduced that all-time series possess a unit root since the null hypothesis either in one case or in both cases was accepted (p-value > 0.05) and hence indicating that the variables are non-stationary. Thus, it could be concluded that all the time series variables are integrated of order 1, i.e., I(1) which is consistent with Tsay (2013). This was confirmed by reperforming the ADF test on the first order differenced time series and the time series became stationary.

Table 3. *ADF test for stationarity*

Variable	No. of Lags	P-Value (no constant and no trend)	H_0	P-Value (constant and no trend)	H_0
MSETRX	1	0.9221	Accepted	0.9667	Accepted
HICP	1	0.07914	Accepted	0.1024	Accepted
TB3m	1	0.01	Rejected	0.08869	Accepted
GB10y	1	0.08292	Accepted	0.9201	Accepted
M3	1	0.99	Accepted	0.99	Accepted
IP	1	0.3661	Accepted	0.01	Rejected

Source: *Own study.*

4.3 Cointegration Test

This was carried out by using the Engle-Granger cointegration test where the null hypothesis was accepted if the p-value was greater than 0.05 and thus concluding that there is no cointegration between the variables.

From the Engle-Granger test it was concluded that there are several cointegrating relationships within the time series, MSETRX is cointegrated with GB10y and M3 and vice versa. Whilst HICP is cointegrated with TB3m and IP and vice versa. A table summarizing the output generated from the Engle-Granger cointegration test is presented in the Appendix (A1.1).

4.4 VECM

The VECM model was fitted since all of the time series variables are I(1) and there is cointegration in the time series. Several VECM models were generated so that the optimal lag order and the optimal number of cointegrating relationships (r) was chosen. The optimal model had a lag order of 4 and r=2, which is presented by equations 3 and 4 below. Only the significant coefficients (i.e., 10% level) for $\Delta MSETRX_t$ and $\Delta HICP_t$ are displayed with the full results are presented in the appendix (A1.2). *Note that the p-values are the values in the brackets.*

$$\Delta MSETRX_t = \underset{(0.0284)}{0.2088}\Delta MSETRX_{t-1} - \underset{(0.0513)}{55.9236}\Delta HICP_{t-3} - \underset{(0.0042)}{80.5981}\Delta HICP_{t-4} \quad (3)$$

$$\Delta HICP_t = \underset{(0.0783)}{0.000018}ECT1 - \underset{(0.0003)}{0.1512}ECT2 + \underset{(0.0272)}{0.7217}\Delta TB3m_{t-1} - \underset{(0.0012)}{0.0010}\Delta MSETRX_{t-2}$$

$$- \underset{(0.037)}{0.0004}\Delta M3_{t-2} - \underset{(0.096)}{0.5462}\Delta TB3m_{t-3} + \underset{(0.04)}{0.1826}\Delta HICP_{t-4} \quad (4)$$

where,

ECT1 and ECT2 are the first and second error correction terms respectively,
Δ denotes the first difference of the respective variable, and
Π is given by the error correction terms multiplied by the cointegrating relationships (i.e., r1 and r2) as shown below:

$$\Pi = \begin{pmatrix} 0.023 & 6.66 \\ 0.00002 & -0.15 \\ 0.00001 & 0.019 \\ 0.000005 & -0.004 \\ 0.017 & -59.3 \\ -0.00003 & 0.23 \end{pmatrix} \begin{pmatrix} 0 & 0 & -7433.36 & -5724.82 & -2.82 & 534.0 \\ 2.7 * 10^{20} & 1 & -1.64 & 1.15 & 0.00017 & -0.07 \end{pmatrix}$$

$$\therefore \Pi x_t =$$

$$\begin{pmatrix} 1.8 * 10^{21} & 6.66 & -181.89 & -124.01 & -0.06 & 11.82 \\ -4.05 * 10^{19} & -0.15 & 0.10 & -0.29 & -8.19 * 10^{-5} & 0.02 \\ 5.13 * 10^{18} & 0.019 & -0.12 & -0.04 & -2.5 * 10^{-5} & 4.01 * 10^{-3} \\ -1.08 * 10^{18} & -0.004 & -0.03 & -0.03 & -1.47 * 10^{-5} & 2.95 * 10^{-3} \\ -1.60 * 10^{22} & -59.3 & 29.12 & 165.52 & -0.06 & 13.23 \\ -6.21 * 10^{19} & 0.23 & -0.15 & 0.44 & 1.24 * 10^{-5} & -0.03 \end{pmatrix} \begin{pmatrix} MSETRX_{t-4} \\ HICP_{t-4} \\ TB3m_{t-4} \\ GB10y_{t-4} \\ M3_{t-4} \\ IP_{t-4} \end{pmatrix} \quad (5)$$

The above matrix (Π) shows that Π is not a full rank matrix which is consistent with the ADF test that x_t is integrated of order one [i.e., $x_t \sim I(1)$] and so all stochastic components are stationary in the fitted VECM.

4.5 Misspecification Tests

The VECM was then checked for its adequacy by conducting misspecification tests, which included testing the serial correlation of the residuals as well as their normality. The LjungBox test for serial correlation was used to assess whether the residuals of the fitted VECM model are correlated. Table 4 shows that there is no serial correlation between the residuals since the p-values in all lag orders is greater than 0.05.

Table 4. *LjungBox Test for Serial Correlation*

Lag Order	Test Statistic	Degrees of Freedom	p-value
5	75.41114	180	1.0000000
10	239.49728	360	0.9999998
15	438.83634	540	0.9994700
20	633.46752	720	0.9908853
25	800.05277	900	0.9925179
30	980.38341	1080	0.9860483

Source: *Own study.*

The Shapiro-Wilk test was used to check whether the normality assumption of the residuals is met. The test gave a p-value of $4.948x10^{12}$ which is smaller than 0.05 and thus, unfortunately, the normality assumption was rejected indicating that the residuals do not follow a normal distribution. However, non-normality is not an exclusive source for biases and so it was decided that since the LjungBox test conducted was satisfactory, the normality assumption assumed in the VECM is not sufficient to invalidate the results of the VECM.

5. Discussion of Findings

5.1 Variables Affecting Stock Returns Directly

The VECM shows that only the lagged HICP and $MSETRX_{t-1}$ variables have a significant impact on describing MSETRX. For MSETRX, a possible justification for the fact that the stock returns variable is influenced only by the previous one month could be because such variable becomes stationary at lag 1. Another reason which was emphasized by all interviewees is that most Maltese investors are forward-looking. Nonetheless, a financial analyst who was interviewed said that investors who have been investing for a long time still give importance to past stock returns and experience. In fact, there are instances where such investors are reluctant to invest or opt for securities due to a negative past experience. Furthermore, it highlights the fact that historical Maltese stock returns have a short-term impact on present Maltese stock returns.

Stock prices are not only influenced by historic changes, but reflect expectations about the future, including future inflation, future interest rates and the firm’s future profitability. Another reason may be the co-movement with developments in other markets, especially for firms that are heavily engaged in trade or firms which are presumed to be influenced by the same shocks arising elsewhere (Ando, 2019). Stock markets may also react or overreact to statements by high-profile institutions or policy makers, this was referred to as ‘herd behaviour’ by 3 out of 8 interviewees where after a public announcement is made, people tend to follow what other investors are doing.

Additionally, the expected negative relationship between inflation and Maltese stock returns is depicted clearly in equation 3 showing that it takes 3 to 4 months for Maltese stock returns to adjust for changes in inflation. This corroborates with Buhagiar (2017), in that a highly significant negative relationship was identified. Furthermore, this implies that stock returns in Malta do not provide adequate protection against inflation and hence are not consistent with the Fisher (1930) hypothesis but are consistent with the findings of Erb *et al.* (1995). Nonetheless, previous studies such as Fama and Schwert (1977), Gultekin (1983), Geetha *et al.* (2011) and Chaves and Silva (2018), found a negative relationship in several developed and developing countries including Brazil, Germany, Italy, Malaysia, Switzerland, and US. This may be because of the time series methodology used. In fact, Erb *et al.* (1995) implied that a cross-sectional study would generate results consistent with the Fisher hypothesis unlike time series studies.

Furthermore, 7 out of 8 interviewees argued that although inflation is a good indicator of economic activity, local investors fail to consider inflation in their investment decisions. This was viewed by interviewees as a lack of sophistication amongst

Maltese investors. Instead, they tend to give a lot of importance to dividend income. The scenario in Malta is like the study conducted by Jones *et al.* (2017) which concluded that despite the negative relationship between inflation and stock returns, such relationship only explains 3% of the change in real stock returns. The remaining interviewee argued that inflation is a significant contributor to the volatility of stock returns in Malta.

Another inherent limitation of the Maltese market is that inflation is not given the importance that it merits by local investors and the negative relationship might be due to other factors such as ‘herd behaviour’ as mentioned previously. In fact, only 2 out of 8 interviewees stated that inflation is an important factor before making an investment decision, whilst the others rank inflation mid-way in their scale mostly because in their view inflation is under control at the time the interviews were performed.

The small size of the Maltese stock market renders it highly illiquid, especially when compared to international markets. The 3 to 4 months lag for inflation to have a negative impact on stock returns as illustrated by the VECM, could be a consequence of the stock market illiquidity, which delays the effects of several factors including changes in inflation. In fact, Li *et al.* (2010) who studied the effects of inflation announcements on stock returns in the UK concluded that unexpected changes in inflation rates influence stock returns negatively on announcement day and within 3-days during low inflation periods. This underlines the excessive illiquidity of the Maltese stock market. Moreover, the interviewees suggested that there may be other reasons which are causing inflation, hence leading to a time lag for stock returns to adjust to such fluctuations in inflation for instance the number of foreigners coming to Malta (either on holiday or for work), growth in certain economic sectors and higher interest rates which will increase competition for returns as the price of bonds is pushed up.

5.2 Variables Affecting Inflation Directly and their Impact on Stock Returns

Looking at the HICP equation, one can again see the negative interaction between HICP and MSETRX. Moreover, there is a negative relationship between HICP and M3 whilst a positive relationship between HICP and TB3m (by considering only the most significant TB3m). Therefore, changes in M3 and changes in TB3m have a significant impact in explaining HICP and may be influencing Maltese stock returns indirectly.

The model showed that an increase in money supply by 1 unit, will cause inflation to decrease by 0.0004 units. This implies that the money supply has insignificant influence on Maltese stock returns with an indirect impact through the inflation variable. This is in contrast with Kaul’s (1987) monetary argument which suggests that inflation stimulates the economy’s demand for money, which is met by withdrawing investments, therefore resulting in lower stock returns.

Furthermore, the result developed from the VECM is contradictory to economic theory which states that an increase in money supply leads to an increase in inflation. Indeed, Milton Friedman came up with the well-known statement “Inflation is always and everywhere a monetary phenomenon” (Friedman 1968, p. 39). However, reality does not always reflect economic theory as in the case of Malta as well as Fama’s (1981) findings, which state that higher inflation would push for the implementation of monetary and fiscal policies, resulting in a decrease in money supply, increasing interest rates and restriction of aggregate demand leading to lower stock returns.

A possible explanation for this negative relationship between inflation and stock returns is that the Maltese investor is mainly characterized as dividend seeking, buy-and-hold investor (Sammut, 2002) with normally long holding periods. This was corroborated by all the interviewees who highlighted the importance that Maltese investors give to capital preservation whilst maintaining high returns. Additionally, the interviewees suggested possible reasons pertaining to the anomalous negative relationship between money supply and inflation. These included the specific economic circumstances at the time the study was carried out: current low interest rate scenario, uncertainty in the stock market and the fact that even though money is injected into the economy, investors do not have a propensity to take out investment loans.

5.3 Impact of Money Supply and Stock Returns

With regards to stock returns, Tobin (1969) maintained that changes in money supply are a good indicator and a crucial source of information to explain future stock market returns. However, according to the VECM, there is no direct relationship between money supply and stock returns. This is again surprising since one expects that when money is injected into the economy, it will drive economic growth and ultimately increase demand for equities. As a result, investors will switch to equity due to higher returns over bonds and hence stock prices will rise (Mukherjee and Naka 1995). Fama (1981), Rahman *et al.* (2009) and Humpe and Macmillan (2007) also stated that stock prices are negatively influenced by money supply.

In fact, 6 of the 8 interviewees argued that money supply should have an impact on stock returns if the money in circulation is more than real economic activity, thus fueling consumer demand when companies have not yet provided enough supply to meet that demand. This creates inflation and triggers the cycle of inflation impact on corporate equity and returns.

On the other hand, 2 interviewees were of the view that in Malta money supply does not influence stock returns. They suggested that other economic factors such as consumer confidence and the general underlying health of the economy affects stock returns. They opined that as stocks are a long-term investment, it is unlikely that short term factors such as money supply affects their returns. Additionally, the fact that money supply does not affect stock returns reflects that Malta is still a high savings community.

5.4 Impact of Interest Rates on Stock Returns

The VECM results show that both short- and long-term interest rates were deemed to be insignificant in explaining stock returns. This was unexpected because both economic theory and prior studies show a positive relationship such as Lee (1992), Fama and Schwert (1977) and Khan and Yousuf (2013). Furthermore, given that long-term interest rates provide an indication of the future economic climate and determine the cost of borrowing, one expects that long-term interest rates should have an impact on stock returns. Ferrer *et al.* (2016) deduced that the relationship between long-term interest rates and stock returns differs significantly from one country to another and the relationship varies over time with respect to the time horizon considered. This was depicted by the positive relationship between inflation and stock returns which was found to be stronger in times of uncertainty in the UK as opposed to being stronger at the start of the global financial crisis. In Germany, France, the Netherlands, and Finland the link between long-term interest rates and inflation was stronger when the global financial crisis commenced in 2007.

With regards to the lack of interdependence between long-term interest rates and the Maltese stock market, 4 interviewees said that the stock market only focuses on short-term interest rates. As soon as the indications on short-term interest rates change, the markets will react accordingly since short-term interest rates act as an indicator of long-term interest rates. Therefore, long-term interest rates are perceived as "old news". One of the economists interviewed said that the Maltese stock market is too small and hence one cannot generalize and compare it to the foreign markets. Contrarily, another economist and one of the financial analysts interviewed claimed that if investors are rational[16] then, long-term interest rates should not affect stock returns.

Furthermore, a possible reason as argued by Ferrer *et al.* (2016), is because the relationship between 10-year government bond rates and stock returns is normally observed in one-or two-years' time. Therefore, suggesting that had the study been conducted using yearly data, as opposed to monthly data, the results might have been different. However, using yearly data would have significantly reduced the number of observations.

Contrarily to the model developed in this study and to the above mentioned 4 interviewees, the remaining 4 interviewees stated that long-term interest rates should affect stock returns since they have an impact on investment decisions. Markets do not favor high interest rates and stock prices generally fall when interest rates rise and

[16] Rational investors are investors who base their investment decisions on the quality of the stock and its growth prospects rather than short-term gain.

vice versa. Furthermore, one of these 4 interviewees said that long-term interest rates provide an indication of the future economic climate and determine the cost of borrowing, implying a relationship between long-term interest rates and stock returns.

Findings show that only short-term interest rates show a positive relationship with inflation. This is consistent with the Fisher (1930) hypothesis and with Sweden, US, Euro area, Japan, UK, and Canada (Jonsson and Reslow 2015). Consequently, it is reasonable that economists advise that inflation is kept low to maintain low interest rates. However, since according to the findings of the VECM (*vide* equation 4) which showed that a rise in the previous month's short-term interest rates by 1% will cause a rise in inflation by approximately 0.72 percentage points - the Mundell-Tobin effect, which proposes that nominal interest rates would increase less than one-for-one with inflation, seems to be more appropriate in explaining the relationship between inflation and interest rates in Malta (Mundell 1963; Tobin 1965).

Additionally, this shows that short-term interest rates might be a key driver to the inflation-stock returns relationship as derived by Balduzzi (1995) who analyzed the negative inflation-stock returns relation and concluded that interest rates function as a better proxy than real activity. This was also corroborated by the interviewees, where 6 out of 8 interviewees claimed that interest rates influence the inflation-stock returns relation. However, the remaining 2 interviewees contradicted Balduzzi (1995) with respect to the Maltese scenario by arguing that local investors are more concerned with capital preservation and returns in their investment decisions rather than by the level of interest rates in the local market. Therefore, the relationship between inflation and short-term interest rates should not affect the inflation-stock returns relation.

5.5 Impact of Industrial Production on Stock Returns and Inflation

A surprising result was the fact that the industrial production variable was found to be highly insignificant both with stock returns and inflation. This contradicts Fama's (1981) argument which deduced a positive relationship between real stock returns and real activity, and a negative relationship between inflation and real activity, which when both relationships are combined yield a negative inflation-stock returns relation. These results are also inconsistent with several studies in both developed and developing countries such as in the United States (Fama, 1990), Brazil (Chaves and Silva, 2018), Malaysia (Rahman *et al.*, 2009), Japan (Humpe and Macmillan, 2007), Canada, Spain, Switzerland (Ely and Robinson, 1997), Germany, Italy, United Kingdom (Nasseh and Strauss, 2000) and Australia (Paul and Mallik, 2003). Moreover, economic theory also states that stock returns and real activity should be positively related, implying that as industrial production increases in real terms, their net asset value should increase.

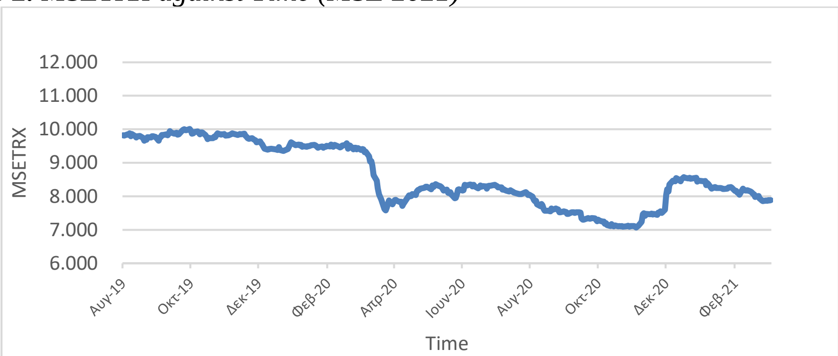
In addition, all the interviewees argued that real activity should influence both inflation and stock returns, in particular if investors consider that a particular shock to economic activity would impact firms' earnings and profitability. A possible reason provided by the interviewees for real activity being insignificant to both inflation and stock returns, could be due to the lack of sophistication of Maltese investors and due to the fact, that at the time the study was conducted there was an environment of very low inflation. However, the interviewees also said that in Malta markets respond relatively quick to news about economic performance. An interviewee also said that real activity has an indirect effect on stock expectations rather than on stock returns per se and this might be the reason why it is insignificant.

Albeit, the findings from this study corroborate with findings in Pakistan (Hasan and Nasir, 2008; Khan and Khan, 2018) and in Japan (Hamao, 1988) where the industrial production variable does not impact stock returns. This insignificant relationship may be explained by the fact that the Maltese economy has been shifting from the industrial sector into the services sector. This can be justified further by the fact that on the Maltese stock exchange only one manufacturing company is listed which is Simonds Farsons Cisk plc.

5.6 Impact of COVID-19 on Stock Returns

Other significant shocks such as COVID-19 represent a negative shock to demand, supply and investors' confidence. Although the impact of these shocks on activity is negative, that on inflation can be negative or positive, depending on how the supply side of the economy reacts. On one hand, the supply side of the economy may not be affected by the shock, but on the other hand if demand falls, this will result in a downward pressure on prices. However, if the economic capacity is affected more negatively than demand, supply falls leading to price increase. This would impact the relationship between inflation and stock prices and hence the inflation-stock returns relation. Figure 2 below shows the movement in MSETRX just after this study was conducted, that is August 2019 to February 2021. The chart below shows that the MSETRX index dipped downwards towards the end of March 2020 and remained volatile during the rest of the year. This is a clear indicator that COVID-19 influenced Maltese stock returns negatively.

Figure 2. *MSETRX against Time (MSE 2021)*



Source: *Own study.*

The interviewees highlighted that the impact of COVID-19 was more company specific in that, whether the company has enough cash to be able to keep up with the payments. Additionally, as mentioned previously, local investors are unsophisticated and during unexpected adverse events, tend to act irrationally and this might have negative implications on the inflation-stock returns relationship. However, the interviewees believed that significant shocks will not reduce the impact of inflation on stock returns, but such shocks will affect the whole inflation-stock returns relationship.

COVID-19 has been reflected through the instability of financial markets and volatility in returns and hence this makes it difficult to be able to identify the influence of inflation from other factors (for instance earnings' expectations and uncertainty) during this period. Furthermore, the interviewees are of the view that COVID-19 is a temporary shock and so expect that in the long term once the extreme event abates, the historical relationship between inflation and stock returns would be restored.

6. Conclusion

The study focused on the relationship between inflation and stock returns in Malta and the identification of the causes of such relationship. The findings from the VECM infer that the stock returns variable is influenced only by lagged stock returns and by inflation at lags 3 and 4, indicating that Maltese stock returns take 3 to 4 months to react to changes in inflation. Additionally, there is a strong negative relationship between inflation and Maltese stock returns which implies that Maltese stock returns do not provide adequate protection against inflation. Furthermore, it was deduced that short-term interest rates and money supply might contribute to the negative inflation-stock returns relationship since both variables were found to be significant in explaining inflation, with short-term interest rates affecting inflation positively and money supply affecting inflation negatively. Long-term interest rates and industrial production variables were found to be insignificant in explaining both inflation and stock returns in the Maltese scenario.

Furthermore, the findings confer that the Maltese stock market is still small and at the early stages of its development. This made it somewhat difficult to be able to compare it with foreign markets. Nonetheless, comparisons with other countries help in setting a benchmark for the Maltese market's future prospects.

From the qualitative segment of this study, the lack of sophistication of Maltese investors was highlighted, in that although inflation is a good indicator of economic activity, local investors fail to consider inflation in their investment decisions, but instead they seek a high dividend pay-out and capital preservation. The concept of 'herd behaviour' surrounding the Maltese stock markets was also underlined.

Finally, this study has added value to both investors and policy makers in that inflation, short-term interest rates and money supply should be taken into consideration when making investment decisions or in setting policies. Ultimately, this study has shown that there are several factors at play which influence the inflation-stock returns relationship and so it is imperative that all these factors are considered prior to making investment decisions or implementing policies.

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Appendix:

Quantitative Segment – Results

Table A1.1: *Engle-Granger Test for Cointegration*

A1.1: Results obtained from the Engle-Granger Test for Cointegration

Variables	**EG**	**p-value (type 1 – no trend)**	**Accept/ Reject H_0**
MSETRX, HICP	-0.629	0.1	Accept
MSETRX, TB3m	-2.1	0.1	Accept
MSETRX, GB10y	-3.3198	0.0206	Reject
MSETRX, M3	-3.82	0.01	Reject
MSETRX, IP	-1.03	0.1	Accept
HICP, MSETRX	-2.8329	0.0581	Accept
HICP, TB3m	-3.4084	0.0147	Reject
HICP, GB10y	-2.8141	0.0612	Accept
HICP, M3	-2.7411	0.0732	Accept
HICP, IP	-2.9430	0.0459	Reject
TB3m, MSETRX	-4.88	0.01	Reject
TB3m, HICP	-3.2827	0.0231	Reject
TB3m, GB10y	-3.95	0.01	Reject
TB3m, M3	-4.02	0.01	Reject
TB3m, IP	-2.37	0.1	Accept
GB10y, MSETRX	-3.56	0.01	Reject
GB10y, HICP	-1.03	0.1	Accept
GB10y, TB3m	-1.79	0.1	Accept
GB10y, M3	-2.5	0.1	Accept
GB10y, IP	-1.13	0.1	Accept
M3, MSETRX	-3.99	0.01	Reject
M3, HICP	-0.631	0.1	Accept
M3, TB3m	-1.8	0.1	Accept
M3, GB10y	-2.38	0.1	Accept
M3, IP	-0.519	0.1	Accept
IP, MSETRX	-3.3786	0.0167	Reject
IP, HICP	-3.2169	0.0276	Reject
IP,TB3m	-2.7463	0.0724	Accept
IP, GB10y	-3.2422	0.0259	Reject
IP, M3	-3.0063	0.0417	Reject

Table A1.2: *Vector Error Correction Model with a lag order of 4*

A1.2: Results obtained from the VECM with lag order 4

	Equation MSETRX	**Equation HICP**	**Equation TB3m**	**Equation GB10y**	**Equation M3**	**Equation IP**
ECT1	**0.0023** (0.0032)	**0.000018** (0.00001)	**0.00001** (0.000003)	**0.000005** 0.000003	**0.0167** (0.0044)	-0.000028 (0.000089)
ECT2	6.66 (12.61)	**-0.15** (0.04)	0.019 (0.0116)	-0.004 (0.0115)	**-59.20** (17.16)	0.23 (0.35)
$MSETRX_{t-1}$	**0.209** (0.094)	0.0004 (0.0003)	-0.0001 (0.000087)	0.0000074 (0.000086)	0.1275 (0.1279)	0.0008 (0.0026)
$HICP_{t-1}$	-11.99 (29.143)	0.0545 (0.0930)	0.0062 (0.0268)	0.0037 (0.0266)	62.6948 (39.656)	0.5908 (0.8047)
$TB3m_{t-1}$	100.406 (101.029)	**0.7217** (0.3223)	**0.1965** (0.093)	-0.0524 (0.0922)	-209.56 (137.47)	2.7451 (2.7895)
$GB10y_{t-1}$	-38.023 (113.602)	0.4045 (0.3624)	0.1419 (0.1046)	**0.3831** (0.1036)	**317.323** (154.58)	1.2498 (3.1367)
$M3_{t-1}$	0.12 (0.067)	-0.00009 (0.0002)	-0.000022 (0.000061)	-0.000029 (0.00006)	-0.1280 (0.0911)	0.0023 (0.0018)
IP_{t-1}	0.6941 (3.8376)	-0.015 (0.0122)	-0.001 (0.0035)	-0.0047 (0.0035)	**-18.8541** (5.222)	**-0.401** (0.106)
$MSETRX_{t-2}$	0.0868 (0.0956)	**-0.001** (0.0003)	0.0001 (0.000088)	0.00002 (0.000087)	0.0584 (0.1301)	0.0006 (0.0026)
$HICP_{t-2}$	29.7146 (28.958)	0.0751 (0.0924)	**-0.0539** (0.0267)	0.0027 (0.0264)	30.1288 (39.404)	-0.1784 (0.7996)
$TB3m_{t-2}$	117.776 (102.14)	0.3536 (0.3258)	0.046 (0.094)	0.0403 (0.0932)	-47.6182 (138.986)	-2.4834 (2.82)
$GB10y_{t-2}$	-55.0976 (119.65)	0.1468 (0.3817)	0.1671 (0.1101)	0.0551 (0.1092)	-15.785 (162.8148)	1.7379 (3.3037)
$M3_{t-2}$	-0.0088 (0.0665)	**-0.0004** (0.0002)	-0.000003 (0.000061)	-0.000076 (0.000061)	-0.0457 (0.0904)	0.000096 (0.0018)
IP_{t-2}	-1.187 (4.1067)	-0.0043 (0.0131)	-0.0016 (0.0038)	-0.0064 (0.0037)	-3.6998 (5.5882)	**-0.3103** (0.1134)
$MSETRX_{t-3}$	0.0391 (0.1001)	0.0003 (0.0003)	-0.0002 (0.000092)	-0.0002 (0.000091)	-0.207 (0.1362)	0.0013 (0.0028)
$HICP_{t-3}$	-55.9236 (28.3769)	-0.0132 (0.0905)	-0.0042 (0.0261)	0.0095 (0.0259)	18.1108 (38.614)	-0.3049 (0.7835)
$TB3m_{t-3}$	108.1764 (101.97)	-0.5462 (0.3253)	**0.2348** (0.0939)	-0.02 (0.093)	-182.141 (138.75)	1.7025 (2.8155)
$GB10y_{t-3}$	-39.6729 (117.66)	0.3907 (0.3753)	-0.116 (0.1083)	0.0416 (0.1073)	265.393 (106.103)	1.5178 (3.2487)
$M3_{t-3}$	0.0175 (0.0671)	-0.0003 (0.0002)	-0.000013 (0.000062)	-0.000045 (0.000061)	**0.1859** (0.0913)	0.0003 (0.0019)
IP_{t-3}	-3.358 (3.804)	0.0077 (0.121)	-0.0009 (0.0035)	**-0.007** (0.0035)	-1.4979 (5.1763)	0.0403 (0.105)
$MSETRX_{t-4}$	0.039 (0.099)	-0.0001 (0.0003)	-0.000023 (0.000091)	0.000018 (0.00009)	-0.0926 (0.1347)	0.0018 (0.0027)
$HICP_{t-4}$	**-80.598** (27.530)	**0.1826** (0.0878)	0.0104 (0.0253)	0.0164 (0.0251)	-32.639 (37.462)	**-1.5144** (0.7601)
$TB3m_{t-4}$	-67.323 (100.704)	-0.2326 (0.3212)	-0.0761 (0.0927)	-0.0375 (0.0919)	4.5754 (137.018)	2.1156 (2.7806)
$GB10y_{t-4}$	-151.129	0.0553	**0.2242**	0.0788	197.343	-0.9019

	(117.332)	(0.3743)	(0.108)	(0.107)	(159.658)	(3.2397)
M3$_{t-4}$	0.0294	-0.0001	-0.000018	-0.0001	0.0762	-0.0027
	(0.0652)	(0.0002)	(0.00006)	(0.00006)	(0.0887)	(0.0018)
IP$_{t-4}$	-4.8303	0.0072	-0.0021	-0.0011	3.286	-0.0043
	(3.3608)	(0.0107)	(0.0031)	(0.0031)	(4.5731)	(0.0928)

Note that the values in brackets show the standard error.