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THE EFFECT OF DEFLATION ON THE FINANCIAL MARKETS OF CROATIA AND GERMANY

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ABSTRACT

In recent years, the term deflation has been frequently mentioned in Croatia economic circles. This paper deals with said topic, presenting the influence of deflation and inflation on capital prices in financial markets while taking into account the examples from Croatia and Germany. The goal is to show that annual changes in deflation directly influence capital costs in said markets. The paper is divided into units in a way that starts from defining inflation and deflation, and separating the financial markets by deflation type with examples. It deals with the correlation of interest rates, government bonds and stock prices with nominal and real interest rates. Capital Asset Pricing Model (CAPM) has been selected as a method to check the capital cost deflation impact because it meets the required essential assumptions. The indicated theory is proven by examples throughout the paper.

Key words: *inflation, deflation, capital cost, CAPM model, financial markets*

1. INTRODUCTION

Deflation is the result of an imbalance in the economy that is reflected in the decline of prices. The deflation rate is measured by the GDP deflator and consumer index, and in some cases with the index of producer prices. Monetary neutrality suggests that changes in the amount of money do not affect real variables (production, employment, real wages and real interest rates), therefore the real interest rate and the nominal interest rate should be differentiated. **The real interest rate is the nominal rate minus the inflation rate (Mankiw 2010).** This paper gives an answer to the question of how inflation causes rise in capital prices in financial markets and vice versa. The Capital Asset Pricing model will be used to demonstrate this impact, which will link risk and yield on the example of Croatian and German capital markets.

2. THEORIES THAT LINK INFLATION AND INTEREST RATES

Classical British economists gave **interest rate theory (Irving Fisher 1930), (Böhm von Bawerk 1949)**, in which interest rates determine the amount of savings and investment capital.

2.1. CLASSICAL INTEREST RATE THEORY

Interest rates are important to economists to understand the link between current and future economic cycles through the impact of interest rates on savings and investments. Adapting nominal interest rates to expected inflation rates is called the Fisher effect. Expected inflation is not considered a risk, the risk is unexpected inflation affecting all investments, including those on the capital market. **The expected inflation including real inflation forms long-term interest rates (Mankiw 2010).** This effect does not have to be applicable to a short period of time, primarily because of unexpected inflation, which is caused by various shocks. On the contrary it is possible that unexpected deflation occurs (eg a war that caused a fall in oil prices). The price mechanism allows the balance of the microeconomic model and when it is borne by uncertainty caused by unexpected inflation, the market equilibrium is lost and there is no more economic efficiency in play.

2.2. LIQUIDITY PREFERENCE THEORY

Liquidity preference theory is the theory of short-term interest rate changes (Keynes 1936). The liquidity effect exists but is generally short-term

and is one of the factors that affect the level of interest rates. Keynes described the importance of tendency to invest and the uncertainties with which this tendency decreases. It is assumed that the money supply is non-elastic, or that income can remain unchanged because of money as a resource that is controlled by the state. For Keynes, money demand is the same as the sum of transactional and speculative demand. Inflation is the result of proactive capital policy so as not to diminish the tendency to invest. The interest rate facilitates the flow of savings into investments, rationalizes the available loan offer through investment assets with the highest returns, and brings balance of supply and demand on national money. It thus becomes a state policy tool that regulates the relationship between savings and investment, so interest rates are reduced if the economy is growing sluggish. The financial system is determined by speculative demand and the behavior of the capital market participants. However, it is difficult to determine the height of the natural interest rate even with a time lag. Economic policy is driven by the goal of maintaining a profit rate.

2.3. CREDIT THEORY

Price stability defines the real value of money. Lower interest rates are generally a sign that the value of money is strong. Numerous examples of economic resonance can be found that compare low interest rates with loose monetary policy, based on which projections of future high inflation and raising interest rates are made. **Inflation is always and everywhere a monetary (cash) phenomenon (Friedman 2010).** In a paper on the Japanese economy (Reviving Japan), Friedman argues that higher monetary growth further reduces the short-term interest rates. As the economy revives, interest rates will start to grow. Due to an increase in company's and creditors' inflation expectations, interest rates will end at a higher level than the initial one. However, the interest rate (credit) channel is not the only channel through which monetary policy affects the amount of money in circulation and therefore prices. The level of nominal interest rates includes the expectation of future the value of money. According to Fisher's Hypothesis, the higher the expected inflation, the higher the nominal interest rate, and the creditor will require the debtor to repay a larger nominal amount. An overhauled monetary policy that increases prices (expected inflation) would lead to an interest rate increase and a rigid monetary policy with expected deflation would pressurize interest rates downward (real interest rates could fall below zero)..

Angeloni et al. (2003) investigate the impact of monetary policy instruments on investment in the business sphere. They investigated how interest rates affect business investments in Eurozone countries. They concluded

that differences in interest rates between the observed countries are driven by asymmetric monetary transfer, which means that interest rates are not defined by the price of money but rather the prices of credit in a period of time, also depending on the supply and demand of the credit. The willingness of potential debtors and creditors to engage in credit transactions depends on a number of factors, including the availability of profitable capital investment opportunities. Credit theory proves that the risk-free interest rates are determined by the effect of supply and demand of credit. The credit comes from the domestic banking savings system and from foreign investors. Demand for credit is non-elastic in relation to interest rates, ie significant interest rate change is required in order to change credit demand. **Corvoisier and Gropp (2002) have studied the concentration of the banking sector of the EU states, claiming that it does not lead to an increase in interest rates due to increased competition among banks does not allow it.**

2.4. THE RATIONAL EXPECTATIONS THEORY

The theory of rational expectations proves that money and capital markets are highly efficient and almost instantly incorporate new information into interest rate levels and prices of securities. **The founder of the doctrine of rational expectations Muth (1961) believes that the rationality of expectations can be assured if expectations are in line with models explaining the behavior of economic entities. The starting point of the hypothesis of efficient markets is the assertion that the prices of securities reflect the total available information (Fama 1991). The prerequisite of a strong form of this hypothesis is that there is no cost of information, no transactional costs and no costs for adjusting prices for available information (Grossman and Stiglitz 1980). A more sensible version of the efficiency hypothesis says that prices reflect available information to a point where marginal uses of that information do not outweigh marginal costs (Jensen 1978). If financial markets are effective, interest rates will always be balanced. Vajanne (2007) on the integration of the banking system in the EU talks about the convergence of interest rates on credit and concludes that the process of integration of the money market is realistic regardless of its slowness. Grgić et al. (2006) looks at the monetary convergence of European countries by comparing them with the EU average.**

Due to liquidity needs, banks are interconnected through the common market, which is of the utmost importance for the functioning of the banking system (Ercegovic and Kundid 2011). Bankers need to be cautious because they control somebody else's money, and there are crises because of the bank's natural tendencies to raise interest rates and limit credit as they they can not perfectly predict the future and therefore they not enter into new

investments easily. The Bank is an important microeconomic unit of a macroeconomic entity. As the state of affairs changes, the quality of bank credit changes as well. The primary variable in bank operations is the protection of liabilities, ie business operations that do not endanger the ability of the bank to return to its clients the funds entrusted to it. In order to "protect itself from the future" the bank increases the interest rates, because higher interest rates mean higher profits, and thus greater maneuvering space for the bank. These are strategic decisions of banks that depend on business policy. As the economic situation improves, the conditions for bank lending are improved. As the economy is more stable, the interest rates will be lower because the bank does not have to insure itself with a higher interest rate in asset operations.

3. THE EFFECT OF DEFLATION ON FINANCIAL MARKETS

Central banks can not manage inflation directly, but through interest rates or with the amount of money in circulation (liquidity), thus boosting investment and consumption. **Ahmad et.al. (2013) studies the impact of central bank monetary policy on credit interest rates.** Short-term interest rates show oscillations, while in the long run they show a strong influence of the level of the central bank's interest rate on the market interest rate. The Central Bank of Japan as well as the ECB have defined success with achieving their own target inflation of up to 2% per annum. This control means taking care that the economy is making a profit rate, which is not possible without inflation. Inflation is most often the result of previous policies and events, usually two years back.

In this paper Capital Assesment Model (CAPM) is used to test the claims of the impact of inflation on capital costs as it links the value of capital and its risk return. The model gives a choice of expected yield and variances. **Capital Asset Pricing as a One-Index Model has been developed by (Sharpe 1964), (Lintner 1965), (Mossin 1966)** and is represented by the formula:

$$E(r) = R_f + \beta \times (R_m + R_f)$$

$E(r)$ – the cost of capital or the expected return on the security

R_f – risk-free return (most often based on ten-year government bonds)

β – beta (a measure of market risk / security price movement in relation to the market)

R_m – market return (the relevant "index" is taken, eg in Croatia it is Crobex)

The assumption for CAPM is that there is a risk that can and can not be diversified (systemic risk). The interest rate reflects the risk premium against the risk-free investment, for which the interest rate of the long-term government bond is used, which is affected by inflation, that is deflation. Systemic risk refers to unpredictable market factors, such as inflation, exchange rate, GDP growth or decline, etc., and all market participants are subject to it regardless of productiveness, product quality and business scope. The beta coefficient represents the risk associated with a security that measures its non-diversifying risk, more precisely the shares compared to the overall market return or some index (Crobex, S & P500).

3.1. CASE ANALYSIS OF GERMANY

The impact of deflation on financial markets will be looked at in the German market, which is historically the closest to the Croatian market. There is a difference between understanding inflation in Germany versus Croatia. Germany has achieved an unemployment rate below 4%, which contributes to a very high level of liquidity in account balances and makes it more difficult for the peripheral countries to improve competitiveness in comparison. Using Deutsche Bank's data and comparing them with the CAPM model with an intangible premium (the German government's ten-year bond), we will try to answer the question of whether inflationary changes cause capital price fluctuations in the German financial market. As a risk-free premium, a 10-year German government bond will be used, and as a benchmark for long-term interest rates the required securities yield in Germany will be used. The risk of government bonds is negligible, while for other types of bonds the risk is significant. Deutsche Bank's data will serve as an example of a developed financial market:

Table no.1. CAPM variables for the Republic of Germany from 2000 to 2015.
 (Frankfurt Stock Exchange)

<i>Date</i>	31.12.2000.	31.12.2005.	31.12.2010.	31.12.2015
Inflation (Germany)	1,40%	1,90%	1,20%	0,10%
Risk-free market premium	5,26%	3,35%	2,74%	0,50%
Market risk premium	5,51%	4,79%	4,31%	6,25%
Calculation:				
Expected market return	10,77%	8,14%	7,05%	6,75%
Cost of capital	15,71%	17,46%	16,88%	12,99%
Cost of capital:				
Allianz	9,90%	12,41%	10,40%	7,59%
Deutsche Post	6,44%	7,18%	7,04%	6,98%

Adidas	9,25%	12,61%	12,04%	9,30%
Deutsche Telekom	10,21%	10,43%	9,51%	7,47%
Münchener Rück	15,82%	16,43%	11,97%	7,96%
Beta coefficient:				
Allianz	0,43	1,11	1,09	1,05
Deutsche Post	0,11	0,47	0,61	0,96
Adidas	0,37	1,14	1,32	1,30
Deutsche Telekom	0,46	0,87	0,96	1,03
Münchener Rück	0,98	1,61	1,31	1,11

Source: Deutsche bank AG data taken from: www.mojedionice.com

The premium of market risk in Germany is very significant when comparing inflation trends with the yield of German government bonds. The table shows that the results are consistent because changes in the expected return on capital and inflation are moving in the same direction. It is apparent that the data is not in full correlation, ie a 2% deflation increase does not cause a 2% capital cost reduction. This means that the movement of capital costs affects inflation and other elements of systemic risk. There are a lot of elements to this and the most significant are the changes in the relative inflation rate, the change in the relative interest rate, the change of expectations of future exchange rates, the relative level of change in income and government regulatory changes. Regardless of the impact of these variables, the example consistently shows the correlation between inflation and cost of capital, and inflation as a component of systemic risk has the decisive influence.

3.2. CASE ANALYSIS OF CROATIA

Through the liquidity credit channel, the European Central Bank also causes deflation in Croatia, reflecting on government bonds, as well as changes in price of the most important Croatian shares. Using data from Zagrebacka banka, the following table presents the risk-free premium of Croatian government bonds and market risk premium, the sum of which makes the expected price changes of shares on the Croatian capital market.

Table no.2. CAPM variables for the Republic of Croatia from 2000 to 2014. (CRO-BEX index)

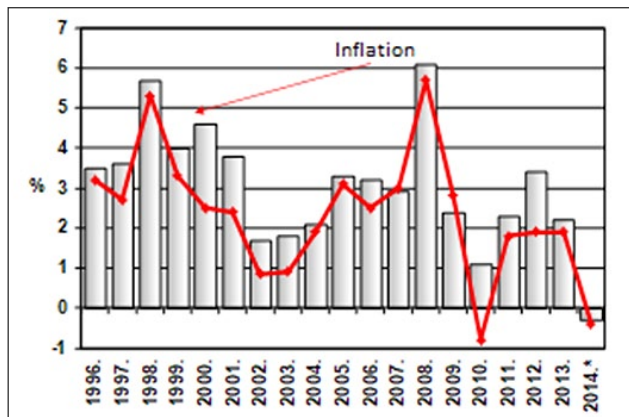
Date	31.12.2000.	31.12.2005.	31.12.2010.	31.12.2015.
Inflation (Croatia)	4,5%	3,00%	1,10%	-0,30%
Risk-free market premium	7,50%	4,42%	6,28%	3,55%
Market risk premium	7,06%	6,29%	7,31%	10,43%
Calculation:				

Expected market return	14,57%	10,71%	13,59%	13,98%
Cost of capital	16,90%	16,77%	24,41%	20,75%
Cost of capital:				
Kraš d.d.	8,66%	7,03%	10,13%	7,46%
Podravka d.d.	8,66%	8,04%	13,62%	13,20%
HT d.d.	10,56%	8,66%	12,22%	10,12%
Končar – Elektroindustrija d.d.	8,86%	8,67%	15,04%	14,87%
Adris grupa d.d.	22,34%	25,56%	29,95%	25,50%
Beta coefficient:				
Kraš d.d.	0,08	0,24	0,28	0,28
Podravka d.d.	0,08	0,34	0,54	0,69
HT d.d.	0,21	0,40	0,44	0,47
Končar – Elektroindustrija d.d.	0,09	0,40	0,64	0,81
Adris grupa d.d.	1,02	1,97	1,74	1,57

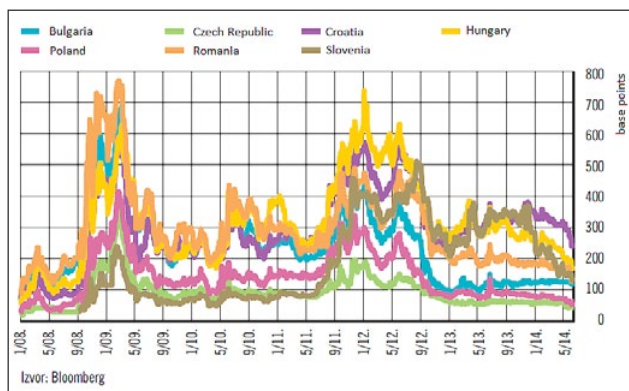
Source: Zagrebačka banka Zagreb d.d. data taken from: www.mojedionice.com

Anomalies on the Croatian financial market which were triggered by the crisis in 2008 reflect the global economic situation and the rise in the prices of securing risk of excessive deficits in transition countries. The rise in CDS prices causes a rise in profit demand on the Croatian capital market (CAPM R_m formula). As a result, Croatia's bonds in the post-risk period are more risky than German bonds. Croatia's debt risk reduces the possibility of issuing government bonds on the foreign market and increases risk premiums. However, looking at the beta of Croatian companies, the risk movement is consistently following deflation, similar to German companies. According to the CAPM model, the anomalies in the Croatian financial market have been triggered by a large increase in market risk premium, ie interest rates through the credit channel (CDS growth). Despite this, the impact of deflation on the overall decline in interest rates and the reduction in total cost of capital is evident, as is the impact of deflation on financial markets in general. **For example, Bokan et al. (2010) studied the impact of the global financial crisis on economic activity and on the financial market situation in Croatia.** During the crisis period 2008-2009. banks in Croatia were taking loans from maternity banks, which led to an increase in interest rates on loans on the Croatian financial market. If the financial crisis affects the growth of interest rates, using the CAPM model on German and Croatian markets it can be concluded that deflation will affect the reduction in the expected return on financial markets.

Picture no.1. Inflation trends in Croatia



Picture no.2. The movement of transition countries insurance premiums (CDS)



4. CONCLUSION

This paper shows the impact of deflation on financial markets through the reduction of interest rates, which also causes a reduction in the cost of capital. The more deflation expectations are higher, more savings will be made, less investments will be made, there will be a reduction income and the effects of deflation will reduce stock prices. Through risk-free expected return, and the ratio of risk and return on the Croatian financial market, using the average values from 2000 to 2015 the CAPM model points that the deflation in Croatia affects the expectations of growth of returns. Although market risk premiums and credit interest rates have increased for the Croatian financial market, de-

flation has not reduced the expected return on the capital market but only slowed it down, as is the case with the German financial markets. The reason for applying the CAPM model derives from the growth of risk premium, ie the anomaly of the excessive discount on long-term government bonds caused by the movement of insurance premiums (CDS). The risk premium is compensated for investors due to the uncertainty of the future value of the shares determined by cash flow and according to the expected movement of the unpaid rate and premiums.

Changes in expectations on the basis of deflation in the Croatian market are a reflection of the imprecise application of the CAPM model, due to the invisible components of systemic risk. The model measures the impact of systemic risk on stocks, but does not take into account the influence of other risks and psychological effects specific to a particular country. Beta is calculated by regressing historical data which is a disadvantage because it relies on data that does not have to be a reliable indicator of the future. Due to the inability of the model to measure other variables affecting the movement of the cost of capital on the Croatian financial market, this papers' assertion can not be absolutely affirmed or dismissed. This does not indicate a poor choice of the CAPM model, as the financial market deflation impact impetus was achieved by the CAPM model on the example of the German financial market for the period 2000 to 2015.

The contribution of this paper is an indication of anomalies in the Croatian financial market, whereby the Central Bank of Croatia has been given a potential advantage for quantitative easing. The fall in interest rates in Croatia could have been achieved with a proactive monetary policy with small constraints. There was a window of opportunity to create short-term generous liquidity conditions for commercial banks in order to stimulate consumption and investments, which the Central Bank of Croatia did not take advantage of again due to fear of exchange rate fluctuations. Namely, the price of capital on financial markets also depends on expected exchange rate fluctuations, which responds in the opposite direction to the interest rate differential between countries. The occurrence is known as interest rate parity, and occurs when the difference between interest rates in the country and abroad equates to the difference between the term and spot exchange rate. The criteria of interest rate parity is a balanced foreign exchange market when earnings in different currencies are the same when expressed in the base currency. As long as there is a difference between interest rates at home and abroad, interest rate changes will continue.

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UTJECAJ DEFLACIJE NA FINANCIJSKA TRŽIŠTA HRVATSKE I NJEMAČKE

SAŽETAK RADA

Na prostorima Republike Hrvatske zadnjih se godina spominje pojam deflacija. Ovaj rad se bavi tom temom, odnosno prikazuje utjecaj deflacije i inflacije na cijene kapitala na financijskim tržištima uzimajući u razmatranje primjere Republike Hrvatske i Njemačke. Cilj mu je pokazati da promjene deflacije na godišnjoj razini direktno utječu na trošak kapitala tih tržišta. Rad je podijeljen na cjeline na način da se polazi od definiranja inflacije i deflacije, te podjele financijskih tržišta prema utjecaju vrsta deflacije uz naznačene primjere. Obrađuje povezanost kamatnih stopa državnih obveznica i cijena dionica te nominalne i realne kamatne stope. Kao metoda za provjeru utjecaja deflacije na cijene kapitala izabran je Capital Asset Pricing Model (CAPM) zbog toga što ispunjava tražene bitne pretpostavke. Kroz rad se naznačena teorija dokazuje primjerima.

Ključne riječi: *inflacija; deflacija; cijene kapitala; CAPM model; financijska tržišta*

