THE EUROZONE YIELD CURVE SHAPE DURING COVID19: A PROJECTION OF INVESTMENT AND MACROECONOMIC EXPECTATIONS

Vladislav Lyubomirov Lyubenov[1]
[1]D. A. Tesenov Academy of Economics – Svishtov, Bulgaria
E-mail: *[1]vl.lyubenov@mail.bg*

Abstract: The aim of this article is to provide a substantiated explanation of the shape of the yield curve in relation to the current theoretical reasoning and empirical data regarding the macroeconomic situation and the bond market. The object of research is the yield curve of government securities compounded from the average yields of AAA-rated government securities issued by euro area member states. The first part of the article presents the underlying literature and the theoretical foundations of the research hypotheses as well as the research methodology used. The second part addresses the spot and the forward yield curves in March 2021. The third part presents various empirical data and analyses the development of the bond market during the crisis caused by the COVID-19 pandemic. [1]

Keywords: yield curve, Eurozone, ECB, COVID-19, government bonds.

This article shall be **cited** as follows: **Lyubenov, V.** (2021). The Eurozone Yield Curve Shape during COVID19: a Projection of Investment and Macroeconomic Expectations. Economic Archive, (4), pp. 67-89.

URL: nsarhiv.uni-svishtov.bg

JEL: E43, E44, E47.

* * *

[1] This publication won the "Dr. Ilko Esenazi award in the field of Economics" at the 2021 contest organized by the St. Cyril and St. Methodius Foundation. The research work participated in the contest under the working title "Yield Curve in the Eurozone during the Covid19 Pandemic. The Influence of Investment and Macroeconomic Attitudes on Curve's Shape."

Introduction

The spread of the COVID-19 pandemic lead to a number of socio-economic phenomena caused by the deteriorating economic situation due to the need for measures to prevent the spread of the virus. The crisis, which began in 2020 and continues in 2021, required serious interventions of governments and central banks in order to provide economic stimulus and keep consumer spending levels within acceptable limits. The simultaneous presence of incentives and constraints to economic activities resulted in volatility and uncertainty on the financial markets, which reflect the temporary restructuring of the behaviour of economic agents as a change in the market value of some ~~of the~~ traded instruments.

At the very beginning of the crisis all major fiscal and monetary institutions acted in a similar way to one another – they increased the supply of money while consumption was declining and provided fiscal incentives to severely affected sectors and population groups. After the launch and during the initial stages of the vaccination plans in 2021, the financial institutions began to look forward to the recovery period following the peak of the pandemic. The uncertainty regarding the duration of the period of limited consumer and business spending, the need for capital restructuring, and the existence of lasting changes in the business environment contributed to the polarization of the views of individual institutional investors. In 2021, the two largest central banks (the Federal Reserve and the ECB) adopted radically different approaches and the trends on the government securities markets in Europe and America were very different as well.

In February, the yield rate of the US Treasury bills was increased, which raised fears of inflation and overheating of the economy due to excessive stimuli and extremely high money supply levels. The Federal Reserve then stated that it was in favour of "letting inflation rise above 3%" due to the deflationary bias of the economy over the past period since the beginning of the crisis. The Fed officials also confirmed that they did not intend to allow the yield rates of government securities to fall into the negative range as was the case in Europe. Nevertheless, US government bond real yields were below zero for a significant period before they rose. The result of the Federal Reserve's actions was a sharply upward slopping US Treasury yield curve, which was interpreted in two ways by investors – as a possibility for an upcoming recovery by some and as a sign of an increase in risk, especially in terms of inflation expectations by others.

Meanwhile, the situation in Europe has not been so volatile and polarized. Due to its legal status, the ECB does not have the capacity to pursue a stimulus policy through traditional central bank instruments as the Federal Reserve does. That is why the yields in the euro area did not rise as they did in

the United States. Instead, the yield curve was downward slopping on the short end and upward sloping on the long end. This unusual price distribution in the debt market segments, in turn, raises questions about the implicit reasons behind investors' behaviour.

The aim of this study is to find a substantiated explanation of the yield curve shape in relation to the currently available theoretical concepts and the empirical data regarding the macroeconomic situation and the debt market. The object of research is the yield curve of government securities compounded from the average yields of AAA-rated government securities issued by euro area member states. The first part of the article presents the underlying literature and the theoretical foundations of the research hypotheses as well as the research methodology used. The second part addresses the spot and the forward yield curves in March 2021. The third part presents various empirical data and analyses the development of the bond market during the crisis caused by the COVID-19 pandemic.

1. The yield curve as an economic forecasting model

The theoretical concept of the yield curve was put forward in the mid-1960s in models and publications such as those of Ruben Kessel and Richard Sylla (S. & R., 2005), strategies for analysing and implementing time spreads in the trading of debt instruments of Solomon Brothers' bond house, etc. During the initial stage of development of this model, the spread between long-term and short-term securities was considered an indicator of the future economic activity especially in analyses of the relationship between narrowing the spread and the chances of an imminent recession. In his "History of Interest Rates" (S. & R., 2005) Sidney Hommer examines the bond market over long periods of time and proves that current events have an effect on the debt market, which in turn proves that the economic situation affects all interest rates as well as the prices of commodities and equity instruments. His conclusions eventually lead to the development of empirical research and economic theory, which base the interpretation of yields on a specific number of factors called risk premiums that are predetermined by the overall economic situation and are included in the market price of debt instruments. Later on, in the 1970s, the yield curve concept and in-depth analysis of bond prices and yields became more widespread among financiers, with bond trading strategies being adapted by a wider range of investors, which stirred the interest of analysts and researchers in this field. The strategies for arbitrage of values in the interest rate curve also became the focus of public interest as well as publications by popular mass media, such as *the Economist, the New York Times, the Washington Post*, etc.

Traditionally, the theory draws its conclusions from the slope of the yield curve. A positive slope implies an increase in the maturity premium with increasing bond maturity. If a function is derived from the different maturities and yields of bonds with certain maturity under normal conditions, a proportional relationship between the two factors should be established, i.e. the function should have an upward slope. This means that the investors require higher compensation for holding bonds with longer maturities, which can also be looked at as a compensation for the risk of bond duration.

Bond duration is the weighted average time it takes for a bond to pay off its purchasing price to its investor according to its cash flows. Looking in perspective, if we take into account the possibility that its issuer may go bankrupt, an increase of the duration increases the chance of insolvency, therefore the risk premium should increase. However, if a bond is risk-free, i.e. its issuer cannot go bankrupt, then its holder is exposed to another risk arising from the volatility of the bond's yield, which determines its price. Arithmetically, when calculating the price of bonds, a higher duration, and therefore a longer maturity period, would result in higher current sensitivity to changes in interest rates and higher volatility. The rational behaviour of investors is to demand higher compensation in the form of a risk premium for holding an asset which is riskier in terms of price volatility.

Although the above arguments undoubtedly support the existence of a direct relationship between the maturity and yield of debt instruments, this may not hold in all cases. Such a case is the existence of a flat yield curve, i.e. a situation where investors do not take into account the duration risk when they decide to invest in bonds and buy bonds with completely different maturities at the same or almost the same price. Another hypothetical situation is the inverted yield curve - investors do not require additional risk premiums for longer-term bonds, but instead buy them cheaper, i.e. they do not avoid but seek duration risk. This distorts the market, which could be interpreted as market inefficiency and even as the presence of arbitrage opportunities in the yield curve. From the point of view of the implicit market expectations regarding the economic situation, a flat or inverted yield curve is theoretically an indicator of an impending recession. Practically, not every recession has been preceded by an inverted yield curve (Bauer & Mertens, 2018) but an inverted yield curve was almost always indicative for a market slowdown or decline of profits. So far, there have been cases of inverted yield curve without subsequent recession, but there has been no case of economic crisis without being a preceded by an inverted curve. (Zaloom, 2009).

In reality, the interpretation of the yield curve can be quite ambiguous. Distortions from the normal relationship between yield and time to maturity can differ greatly from previous situations as well as from other indicators that could

be used to forecast the economic development or the direction of the bond market. The different perspectives on one-off situations and the historical development of the yield curve model show the need for an in-depth analysis of the shape of the curve. The upward or downward slope of the curve is not in itself sufficient indicator for a future economic growth or recession. In order to draw sound conclusions, we have to be aware not only of the techniques for calculating the function and values of the curve but also to understand the economic relationships that drive the bond market up or down.

Generally, the analysis of the yield curve aims to answer the question: "Who is making the curve move and why?" (Zaloom, 2009) This means looking at the curve in two aspects - as investors' demand and issuers' supply of debt; and as a market valuation of debt securities. Generally, bonds are issued and bought by governments and corporations. Investors are either large financial institutions, also known as institutional investors (including insurance companies, investment and pension funds and banks), or small investors with relatively limited influence on the market. A change in the capital flows on either side leads to a different equilibrium point of the price of the debt instrument. In addition to the primary market for debt securities described so far, there is also a secondary market on which they are exchanged between investors and on which their prices depend on the interest rate at the time of the transaction. However, many analysts are more excited from the second part of the question, i.e. the causes for changes in the market and the direction of the yield curve. This logic that is based on the market's ability to predict the future. When investors and issuers move strike deals at unusual prices, then their behaviour must be based on their current expectations of what will happen in the future, given their access to market information. Thus, the normal market conditions can be used as a benchmark to make "common sense" predictions about the future performance of the available debt instruments and hence, the future macroeconomic situation.

Various authors, financial analysts and investors put forward different explanations of the causes for an inversed or a flat yield curve that generally fall into three categories:

1. Changes of the risk exposure associated with long- and short-term maturity securities (Zaloom, 2009) (Barneke, 2006) – this explanation can be paraphrased as *Expectations Theory*. This is the classic explanation for an impending recession following an inverted curve. Investors predict that their profits are likely to shrink in the near future and are seeking to protect their money by investing in a sufficiently long-term instrument that can provide them with cash at a lower risk during the recession. Thus the demand for securities with longer maturity become greater than the demand for those with shorter maturity periods because the latter require reinvestment of the full amount of

their par value that should be received during the recession. Some authors paraphrase this explanation as greater certainty and, correspondingly, lower risk premium for longer-term securities over shorter-term ones. (Zaloom, 2009) Other investors are optimistic in accepting a certain reduction of the long-term interest rate based on their expectations for economic growth in the long run following the impending crisis (Svensson, 1994). The theory of expectations can be expressed using the algebra of the interest rate interpolation described below. Despite both the optimistic and the pessimistic speculations regarding the validity of the theory, there is still no direct empirical evidence to support it. Rather, it is based on historical observations of the economic development during and after the reversal of the yield curve.

2. Uncertainty and volatility of future spot interest and inflation rates (Barneke, 2006) – according to this argument, debt security prices change according to investor expectations about certain factors that affect their internal value. When investors expect a decline of the interest rate, this expectation will result to a greater extent in an increase of the price of long-term bonds already held by the investors prior to the change of the interest rate. Therefore, due to the ability of the market to predict the future, the investors would start to develop speculative strategies that would adjust the values even before the interest rate falls. Also, with deflation expectations, the present value of bond cash flows increases, which would increase their demand. Longer-maturity bonds would be revalued more positively in the long run with long-term expectations of a decline in the overall price level, and therefore a preventive market response may lead to a situation when long-term interest rates fall below short-term interest rates.

3. The need for investor liquidity (*Preferred Habitat Theory*) – this is perhaps the simplest explanation for the segmentation by term structure of the market for bonds where bond investors have preference to bond with shorter or longer maturity and there is no connection between the prices of bonds at the two ends of the maturity spectrum. According to this theory, when the yield curve is inverted, bonds assume a secondary function of return-generating savings and are used as a liquidity buffer until their cash flows are received.

The first theory considers the factors that affect the term structure of the yield curve in macroeconomic terms, i.e. factors that are external to the debt market, to explain its direction. The theory second theory explores the causal link between the seemingly more important factors that affect the internal value of the financial instruments and their price. The third theory, however, puts forward radically different conditions and reasons for the direction of the debt market. Therefore, the term structure of the debt market may be affected simultaneously by several groups of factors and thus none of these theories can be accepted as the ultimate methodological base to forecast the yield curve.

2. Research methodology and data sources

The yield curve is used in calculating the yield of zero-coupon bonds. This type of bond does not pay interest but trades at a discount and its face value is paid as a lump sum at maturity. Investors buy such bonds at a discount to its face value, i.e. their profit is the difference between the nominal face value received at the end of the period and the discounted face value at the beginning of its duration.

The price of a zero-coupon bound is calculated as:

$$P = \frac{PAR}{(1+r)^n}$$

The yield of a zero-coupon bound is calculated as:

$$r = (\frac{PAR}{P})^{(\frac{1}{n})} - 1$$

The yields of zero-coupon bonds are completely comparable to those of bonds with different maturities due to the absence of coupon payments. (Prodanov, 2012). In fact, zero-coupon bonds are not always available at every time period Usually, they have short maturity periods, such as 3 months, 6 months, etc. A technique known as *bootstrapping* is used to find the zero-coupon bond equivalent of standard coupon-paying bonds with longer maturities, i.e. to calculate their yield in terms of the yield of zero-coupon bonds.

In the formula for calculating the yield of a standard coupon-paying bond:

$$P = \sum \frac{C}{(1+r)^n} + \frac{PAR}{(1+r)^n},$$

we can replace the discount rates with yields of zero-coupon bonds with the same maturity and thus the formula will be:

$$P = \sum_{t=0}^{n-1} \frac{C}{(1+y_n)^n} + \frac{C+PAR}{(1+y_n)^n},$$

where y_n is the yield of a zero-coupon bond with the same maturity n.

The formula can be written for the zero-coupon bond with maturity equal to the last tenor as:

$$\frac{1}{(1+y_n)^n} = \frac{P - \sum_{t=0}^{n-1} \frac{C}{(1+y_n)^n}}{PAR + C}$$

or:

$$y_n = (\frac{PAR + C}{P - \sum_{t=0}^{n-1} \frac{C}{(1+y_n)^n}})^{(\frac{1}{n})} - 1$$

This technique can be used to calculate the zero-coupon bond yields for all maturity periods of the coupon-paying securities. (Zahariev, 2012) The comparison of these yields and their respective maturities shows the term structure of the yield curve. The difference between yields of two different maturities is the yield spread.

The zero-coupon bond yields for different maturities can be interpolated to calculate the forward rate as:

$$(1 + y_b)^b = (1 + y_a)^a (1 + f_{a,b})^{(b-a)}$$

The forward rate is thus calculated as:

$$f_{a,b} = \left[\frac{(1 + y_b)^b}{(1 + y_a)^a} \right]^{\frac{1}{(b-a)}} - 1$$

There are a number of models in the scientific literature for deriving the interest rate curve, the most popular being the polynomial model and the Nelson-Siegel-Svensson model (Svensson, 1994). This research is based on the Nelson-Siegel-Svenson model because of the reliability of the results it gives, which are as close as possible to the methodology described above for finding the yields of zero-coupon bonds. The model has the following characteristics:

The *instantaneous forward function* can be written:

$$f_{(t)} = \beta_0 + \beta_1 \exp\left(-\frac{t}{\tau_1}\right) + \beta_2 \frac{t}{\tau_1} \exp\left(-\frac{t}{\tau_1}\right) + \beta_3 \frac{t}{\tau_2} \exp\left(-\frac{t}{\tau_2}\right)$$

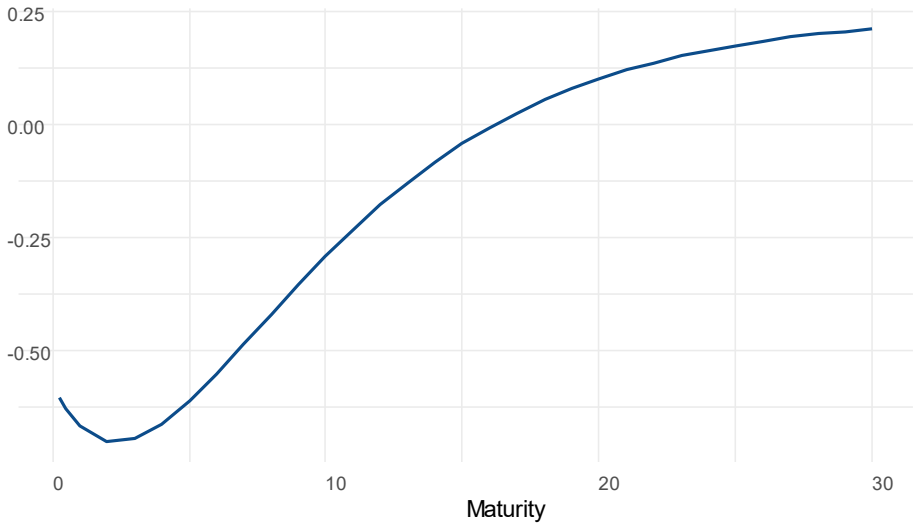
The spot rate function is derived from the forward function as:

$$i_{(t)} = \beta_0 + \beta_1 \frac{1 - \exp\left(-\frac{t}{\tau_1}\right)}{\frac{t}{\tau_1}} + \beta_2 \left[\frac{1 - \exp\left(-\frac{t}{\tau_1}\right)}{\frac{t}{\tau_1}} - \exp\left(-\frac{t}{\tau_1}\right) \right] + \beta_3 \left[\frac{1 - \exp\left(-\frac{t}{\tau_2}\right)}{\frac{t}{\tau_2}} - \exp\left(-\frac{t}{\tau_2}\right) \right]$$

The calculations in this research are performed with data from the official database provided by ECB (ECB Statistical Data Warehouse, n.d.). The bond data series used is "Euro area (changing composition) – Government bond, nominal, all issuers whose rating is triple A – Svensson model, published by ECB". The yield curve data is processed following the same method. The empirical macroeconomic data refer to aggregated cash flows and balance of payments accounts for all Euro area member states also provided by ECB (ECB Statistical Data Warehouse, n.d.), last updated on 04 March 2021.

3. Spot and forward yield curve shape in the Euro area in the beginning of March 2021.

Figure 1 shows the Nelson-Siegel-Svensson spot yield curve of a pooled sample of the government bonds of all countries with a triple A credit rating in the Euro area. The maturities of the bonds in the sample ranges from three months to thirty years. The initial value for the shortest-term securities is -0.6053%. The curve has a downward slope in the first two years, where the shortest-term (two-year) securities have a spot yield of -0.7001%. Beyond the lowest point, the slope of the yield curve turns upward and follows the normal function of the time premium on debt instrument yields. The curve enters the positive range for the seventeen-year securities with a spot yield of 0.0254%. The highest value is expected for the longest-term (thirty-year) securities with a spot yield of 0.2113%.



Note: average for all AAA-rated Euro area member states

Figure 1. ***Spot yield curve***

The shape of the yield curve differs from the theoretical projection with a continuous uniform slope because the actual market is segmented in terms of the maturity of the securities. If the most intuitive way of interpreting the curve is assumed, then the debt market trend implies a recession lasting for about two years after the observation, i.e. a recovery to the pre-crisis levels after two years. Although this hypothesis may initially be accepted as possible and even probable, it still has to be corroborated considering the causal links between the factors that affect the debt market (Ganchev, 2009), the investors on this market

and the factors affecting the GDP (Terziev, Zahariev, Pavlov, Petkov, & Kostov, 2021b). In order to provide a reasoned justification, we took into account the macroeconomic data to analyse some of the main factors that affect the debt market in terms of the different economic sectors.

A more detailed and thorough interpretation of the possible projections of the curve can be made by analysing different time ranges in the term structure.

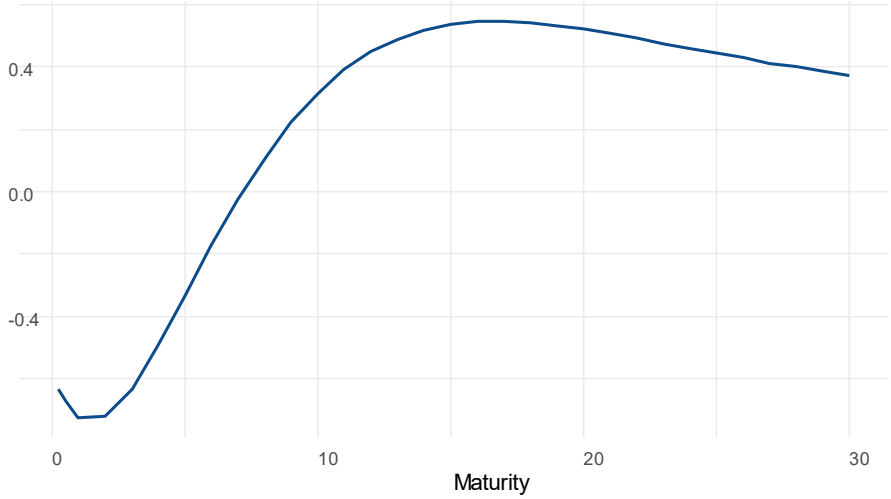
Fisher and Campbell (Campbell & Shiller, 1991) co-authored a number of papers on the ability of the yield curve model to predict future economic fluctuations based on the different spread intervals between bond maturities. This study takes into account their publication, in which they test a model for predicting future values in the curve compared to current ones, e.g. the ability of the spread between two-year and one-year bond yields to forecast the one-year bond yield one year ahead. Their findings show that there is an almost constant overestimation of the spread predictability, which can be explained by the difference in risk premiums between securities with different maturities and, more precisely, the increased risk premium of longer-term securities against which the shorter-term security yields are forecast. They conclude that *the value of a one-year bond in one year should be lower than the spread between two-year and one-year bonds today*. In other words, under normal conditions, the spread between two values of the curve should give a higher result now than the yield of the respective securities in the future with a maturity equal to the time difference in the spread. Naturally, there are some exceptions from this rule both in Fisher and Campbell 's study and in reality after the period of the data sample they used. It is possible to speculate on the cause of the unusual values. The most well-argued explanation in regarding the European bond market today is that the risk associated with certain securities has increased dramatically exceeding its normal values, which coincides with the logic of the expectations theory of an inverted yield curve.

Mishkin obtained very similar results regarding the term structure of the interest rate spread. Frederic Mishkin’s (Mishkin, NBER Working Paper, 1988a) (Mishkin, The Information in the Term Structure: Some Further Results, 1988b) (Mishkin, 1989) publications develop further the research of Fama and Bliss (Fama & Bliss, 1987) who proposed statistical regression methods for finding predictable dependencies between forward and spot interest rates derived by the classical calculation technique for conversion to zero-coupon bonds. The results he obtained in 1988 show a statistically significant relationship between the future term structure of real interest rates and the current structure of short-term nominal interest rates of up to one year. Using a similar methodology in 1989, he examined the relationships between current and future values of securities with maturities of two to five years. The results

of the tests refute the existence of a relationship between the term structure of securities in the relevant time range and the future term structure of real interest rates. Instead, a fully significant dependence was proved for their ability to forecast the term structure of interest rates adjusted for the expected level of future inflation. Mishkin concludes that *short-term interest rates of up to one year are used to forecast real interest rates, while long-term interest rates of one or two to five years are used to forecast inflation rates*.

The research works discussed above as well as the mere logic raise the question for the existence of a risk-free interest rate in a curve with such a shape. If the hypothesis is true, then the lowest yield, i.e. the yield of the lowest risk premium is accepted as risk-free, then the yield curve of the debt of the highest liquidity issuers presented in this way creates a paradox arising from the negative slope of the curve for the first two years. The lowest yield is that of the two-year securities but at the same time they are not the shortest-term ones, i.e. their maturity premiums should include a maturity markup as they are not the shortest-term risk-free instrument that investors may choose. If we consider the German securities, which for a long time had the lowest yields in the EU and were used as a risk-free benchmark, we shall see that in the beginning of March they, together with the debt securities of several other euro area member states, shared a term structure similar to the one summarized in the sample used in this study (World Government Bonds, n.d.). Therefore, we can claim that at that time the yield curve shown in Figure 1 does not actually include risk-free yields, which is a manifestation of a debt market with a negative slope of the yield curve.

Figure 2 shows the forward yield curve calculated using Svensson's method. Svensson (Svensson, 1994) conducted a study of the forward interest rates in Sweden as a monetary policy indicator and proposed models for estimating forward and spot interest rates based on Nelson and Siegel's functional form. In addition to the mathematical models, the paper also examines the results of the received spot and forward rates relative to the overnight interest rate through a graphical method of representation. Swenson raised the question whether the *instantaneous forward* rate can be interpreted as indicating the expected time path of future overnight rates. Although there is a certain correlation, in modern conditions the existence of such a causal relationship can be justified by the overall movement of interest rates gradually downward over the 21st century, which does not provide a significant opportunity to interpret the independent relationship between the instantaneous forward and the overnight rates.



Note: average for all AAA-rated Euro area member states

Figure 2. ***Forward yield curve***

The research conducted by Fama and Bliss (Fama & Bliss, 1987) remains extremely relevant from the point of view of the applied research logic in the construction of a methodology for deriving the term risk premium from the difference between forward and spot interest rates. In their research, they come to the conclusion that "Current 1-year forward rates on 1- to 5-year U.S. Treasury bonds are information about the current term structure of 1-year expected returns on the bonds, and forward rates track variation through time in 1-year expected returns. More interesting, 1 -year forward rates forecast changes in the 1-year interest rate 2- to 1-years ahead, and forecast power increases with the forecast horizon. We attribute this forecast power to a mean-reverting tendency in the 1-year interest rate." (Fama & Bliss, 1987).

The arithmetic mean of the forward curve yields, the median and the various indicators for the sample value range are significantly higher than that of the spot curve, which indicates an expectation for increasing overall interest rate. Considering the market situation, such a scenario is quite probable because the investors may sense that the risk is increasing and may be willing to withdraw their money from the debt market in order to invest in other types of investment (Simeonov, 2012) or redirect their investments from currency funds to short-term securities. This trend was observed for the last few quarters according to the data shown below. Table 1 as well as the comparison between Figure 1 and Figure 2 show a shift of the lowest point of the curve from the second year in the spot curve to the first year in the forward rate curve. This leads to an assumption about the movement of the curve until it reaches its normal shape - the lowest point should move to values with lower maturity until

the lowest maturity and the lowest yield coincide. With this type of data interpretation, the length of time needed to straighten the curve cannot be estimated.

Considering the forecasted market expectation for a two-year recession, it is logical to predict a similar curve shape with its lowest point for one-year securities after one year. If such a shape of the curve is observed earlier, this would mean that the current market expectations for the future are too pessimistic and the market has to be adjusted. If the form is observed later, then the expectations are too optimistic. The interpretation of the negative slope of the curve in the long run is much more unclear. According to the conclusions of some of the publications cited above, this could mean a period of steady inflation, followed by a period of deflation, but in general the interpretation of expectations for a forward rate on government securities with very long maturities is unreliable and there is currently not enough research in this field.

4. A projection of the macroeconomic and investor expectations for the yield curve shape

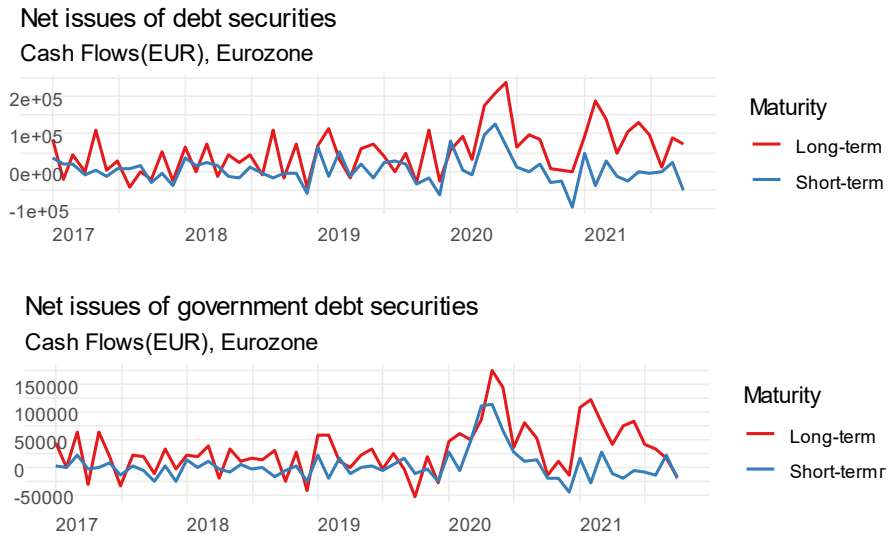


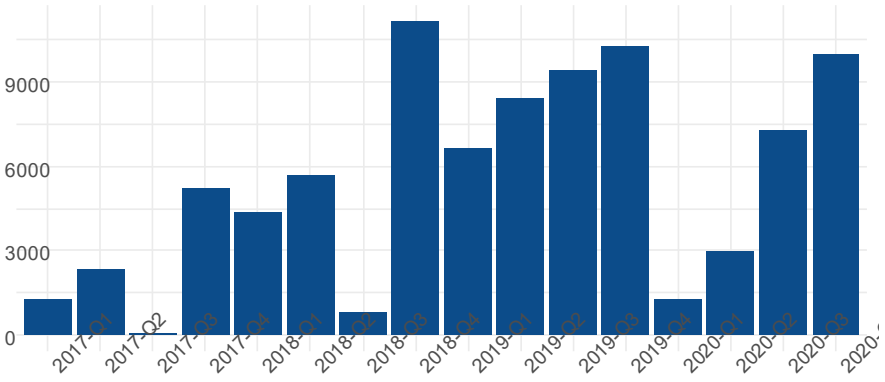
Figure 3. ***Net issues of debt securities (in EUR mln.)***

Figure 3 gives a clear idea of the decrease and increase of the net issues of all short-term and long-term debt securities compared to the net issues of government debt securities. Both graphs show a peak of the demand for debt financing in March 2020 while the ratio of long-term to short-term debt

securities in the Euro area remains relatively constant. At the end of 2020, the volume of the net issues of short-term debt securities falls below zero, i.e. there is a withdrawal of short-term debt securities from the market and an increase of the investments in long-term debt securities. With regard to general government debt, there is a brief moment when the net emissions of short-term debt exceed those of long-term debt, but immediately afterwards a large issue of long-term debt is observed. Throughout 2020, the issues of long-term debt securities exceed those of short-term debt securities. The level of net issues of government debt securities remains positive in 2020, i.e. the total government debt of the euro area countries was increasing steadily over the year.

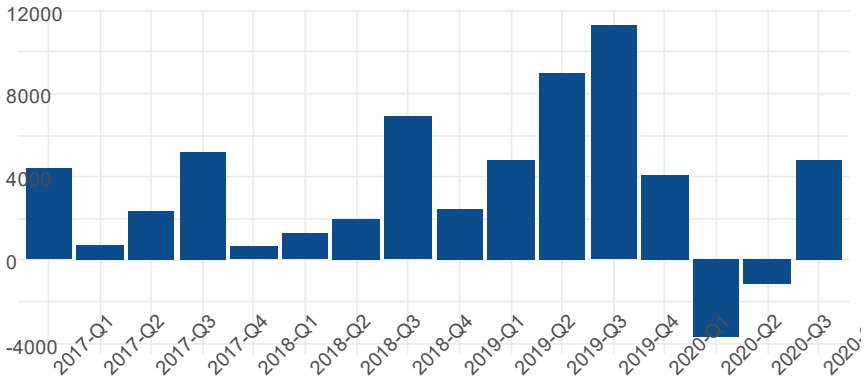
The data leads to the conclusion that although there is an increase in the level of debt, there is no clear preference of the debt issuers to short-term borrowing, which is confirmed in other similar studies (Zahariev, et al., 2020). (Zahariev, et al., 2020). In the course of the recession in 2020, there is even a trend towards slightly higher emissions of long-term debt. A possible explanation for this is the adjustment of issuers to the wishes of investors, i.e. investors have a preference for long-term investments and issuers seek to reduce the interest rates of their debt securities taking into account supply and demand in different market segments. Another probable reason for the change in the term structures of issuers' debt is the consideration of liquidity and reinvestment – the issuers prefer issue debt securities whose face value is to be repaid after the crisis to short-term debt securities they would have to repay by issuing other short-term securities. In such a situation we should also take into account the overall benefit for the issuers of debt arising from the current low interest. When re-issuing short-term debt, issuers are exposed to increased reinvestment risk - if the interest rate increases, then the new debt securities would have higher yields. From this point of view, it is logical to issue debt securities with the longest possible maturity and thus maintain the current interest rate throughout the term of the debt security.

Figure 4 shows the change in net volume of debt securities of all issuers held by key financial institutions by quarters for the period after the first quarter of 2017. Figure 5 shows the change in net volume of debt securities of issuers from the Euro area held by key financial institutions. Figure 6 shows the differences between the values in the first two figures (Figure 4 minus Figure 5).



Note: net cash flows in EUR mln., Euro area, all issuers

Figure 4. ***Change in the aggregate value of debt securities of all issuers, held by key financial institutions***



Note: net cash flows in EUR mln., Euro area, Euro area issuers

Figure 5. ***Change in the aggregate value of debt securities of issuers from the Euro area, held by key financial institutions***

Due to the fact that the net cash flows for the purchase of securities issued by European issuers are included in the total net cash flows, i.e. the volume in Figure 5 is included in that in Figure 4, Figure 6 is the net value of debt securities purchased on the global market excluding those from the European market.

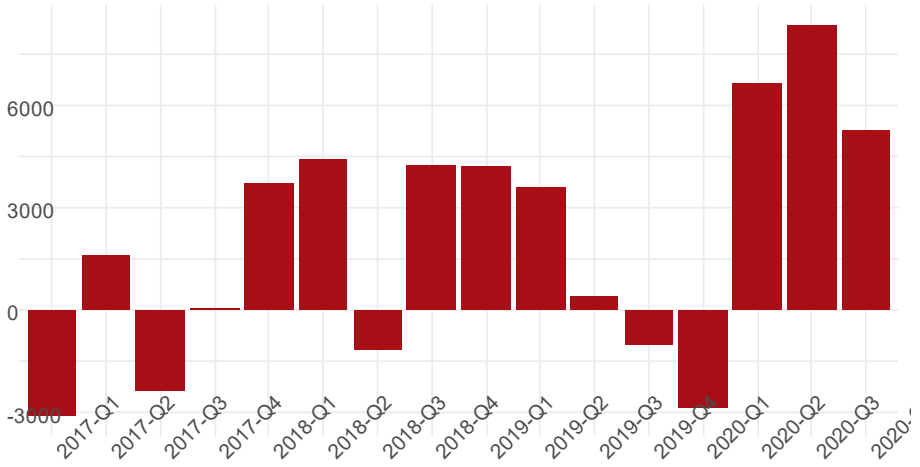


Figure 6. ***Difference between Figure 4 and Figure 5***

The sample includes the book values of the liabilities of key financial institutions (*Financial Vehicle Corporations*) reported by the ECB. These financial institutions include institutional investors with a key role on the market due to the size of the portfolios they manage. Such institutions are investment and pension funds, insurance companies, etc. The criterion for their reporting as such requires that they carry out investment activities as investors, issuers, or both in addition to other activities (if any) they may have.

Figure 4, Figure 5 and Figure 6 give the general picture of the overall demand for debt securities by institutional investors in the Euro area. The data include all types of debt securities, including government and corporate. Figure 4 shows the stockpiling of debt securities by key financial institutions before the COVID-19 pandemic. In 2020, the demand for debt securities remains positive despite the sharp fall of the overall demand for securities in the first quarter of the year. For the next three quarters the demand grew steadily. The decrease of the demand by European financial vehicle corporations on the global debt market could be explained by the sharp increase of the risk of insolvency of issuers who are not risk-free or with the low general interest rates at that time.

The demand by European financial vehicle corporations for European government securities was more volatile. In the first quarter of 2020, the demand for European government securities was strong. Later on, with the situation gradually returned to normal, the European institutional investors got rid of some of the European government securities they held and increased the share of global government securities in their portfolios. Therefore, during the

initial economic shock due to the pandemic, the European institutional investors preferred to invest in local securities despite the fact that the interest rates in Europe were lowest of all. This could be explained by several main factors that affect investor preference:

- The European financial institutions were willing to support the local economy and local governments by investing in local debt securities;
- The European investors have a better overall risk assessment for local issuers of debt securities;
- Currency risk in international investment operations and in particular the risk of devaluation of foreign currencies against the euro.

The last factor is related to the uncertainty regarding inflation and deflation expectations, which were particularly strong at the beginning of the pandemic. From a monetary policy perspective, uncertainty about the future reactions of central banks at the beginning of the crisis should be taken into account. Possible changes in the money supply in certain currencies would affect the exchange rates and the degree of restrictive measures affect consumer spending and the foreign trade. The effects of deflationary and inflationary processes on the present value of cash flows from bonds has an impact on the debt market. In the first quarter of 2020, this impact made the European investors limit the currency risk. The reasons for this temporary trend can be interpreted as a market forecast for the appreciation of the euro against other currencies or more likely as an expectation of volatility or unpredictability related to inflation expectations in the early 2020, which subsided over time.

The overall debt market is ~~extremely~~ strongly influenced by the shape of the yield curve. The yields on the risk-free government securities of issuers from the Euro area are the benchmark used to calculate all key interest rates and estimate the risk margin for the risk segment of the debt market. The overall inflow of funds into the market means an overall fall of the interest rates due to the increased supply of cash to be borrowed and increased competition among investors. The outflow of funds works in a reciprocal way. If the trend of increasing the share of investments in government debt securities continues, the interest rate curve will shift upwards. This will also change interest rates at the short~~-term~~ end of the curve due to the likely reorientation of investments in this segment to more lucrative opportunities outside the euro area. The conditions for raising interest rates and straightening the interest rate curve by redirecting the investments depend largely on factors outside the Euro area's economy, such as expectations of future interest rates on foreign government securities, inflation in economies with currencies other than the Euro, and central bank policies.

Figure 7 shows changes in the inflation rate in the Euro area in terms of the harmonized index of consumer prices, which measures the price level of a

large basket of commodities, the price of which is affects proportionally the household budgets and consumer spending. Despite the fact that the index cannot be used to estimate the changes in corporate asset prices directly, it represents the final change in the purchasing power of individuals and households and indirectly includes the value of all intermediate goods, services and indirect taxes as components of the selling price.

Figure 7. ***HICP – Euro area***

There is a slight decrease of the inflation level during the GDP recession in 2020, but this decrease is comparable to the levels in previous years. Given the market relationship between GDP, price levels and consumer spending, it is possible to conclude that when the volume of production and price levels go down simultaneously, the main driver of the economy is consumer spending, which also decreases due to imposed anti-COVID measures. Despite the persistently low price levels in the second half of 2020, there was a sharp increase of the level of inflation at the end of the year. This could be due to:

- restructuring of business models according to the changes in the demand for consumer goods and services;
- spending household savings in current and deposit accounts;
- certain degree of easing of the measures in some countries;
- positive effect of fiscal measures;
- monetary policy.

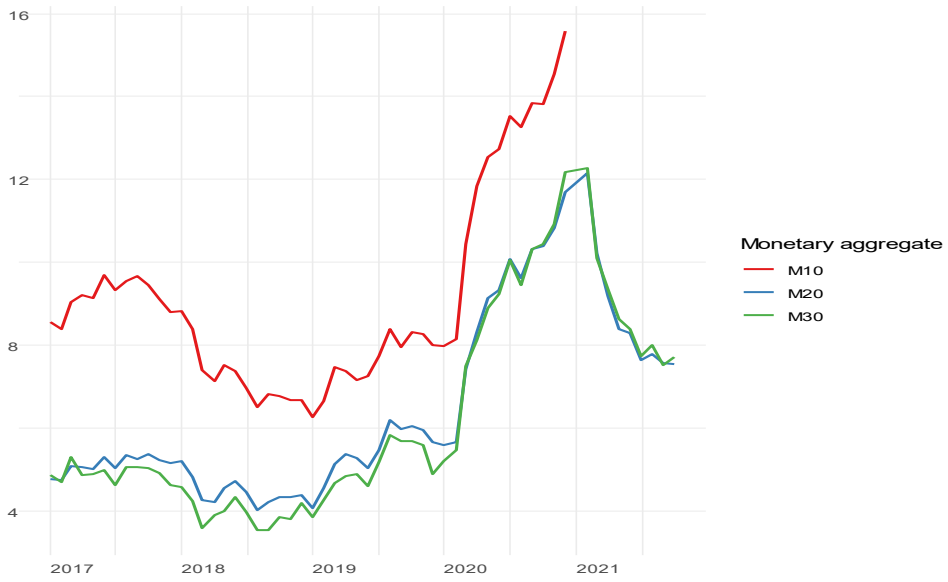


Figure 8. ***Monetary aggregates – Euro area***

Figure 8 shows the changes of the monetary aggregates in the Euro area since 2017. Clearly, the total money supply increased during the recession caused by the pandemic in 2020. There is no significant difference in the trend direction of individual aggregates. Given that the aggregates are inclusive, i.e. M1 is included in M2 and M2 is a constituent part of M3, we may conclude that the general direction of M1 affects the trends of the other two aggregates. M1 includes the most liquid funds from financial instruments and cash equivalents - the currency in circulation as cash, current accounts and overnight deposits. The term structure of the money supply reported by M1 is one day.

Although the sharp increase of M1 creates conditions for higher inflation, in 2020 there were significant deflationary forces as well. This is confirmed by comparing Figure 4 and Figure 5. The drastic increase of the aggregate accompanied by low prices is a sign of unwillingness or inability of consumers to spend more. The amount of money accumulated so far is indicative for future inflation. Given the imposed restrictive measures, the accumulated money supply would contribute to a faster increase of the price levels when consumer spending is restored.

Inflation and macroeconomic factors affect the debt market and the yield curve. One way of linking macroeconomic indicators with the price of government debt, which sets the basic interest rate for the entire debt market, is

the systematic risk expressed as a percentage. In the presence of an overall risk, the yield rate rises through the basic interest rate, which affects all other interest rates. An important factor that complements this observation is the historical sequence of events following the recent global and regional debt crises in 2007-2008. According to the modern financial theory and the practice of central banks in recent years, there are various reasons why central banks should be encouraged to lower the basic interest rates during recession. The main reason is that this would stimulate the economic activity, prevent the decrease of consumption and capital investment during recessionary periods. This policy of the central banks is countercyclical. The arguments for low interest rates in times of economic downturn are clearly seen in their practical application through the overall low interest rate during the crisis caused by the COVID-19 pandemic.

This monetary policy of the central banks is accompanied by some trends that were observed on the global markets during the crisis, viz. the intention of many investors to invest a disproportionate share of their portfolios in debt securities. Naturally, this leads to a decrease of the market interest rates despite the increase of the systematic economic risk. However, the low interest rate poses a risk to the price of the traded bonds because it may reduce the demand for debt instruments, raise their yield rates and, consequently, reduce the return on such investments. For the held-to-maturity debt investments the low interest rates would mean a lower yield or even, as is the case with shorter-term securities, negative cash flows and negative returns.

The ECB's forecast of March 2021 is for an average increase of HICP with 1.5% in 2021, 1.2% in 2022 and 1.4% in 2023. Such values are in a fully productive range for economic development. If this forecast is accurate, then inflation will not be a key factor fundamental for the debt market in Europe. It can even be argued that investors are behaving more irrationally than expected, as they accept low and even negative interest rates curve despite the overwhelming inflationary expectations, i.e. for negative real interest rate and negative real return on future cash flows from investments in government debt securities.

The negative short-term interest rates during the COVID-19 crisis are not a precedent for the Euro area. In fact, investors are quite accustomed to this phenomenon and it is to some extent a continuation of the trend in recent decades for gradual reduction of the yields of the risk-free government debt

securities over time. One of the questions that arises regarding the situation on the European debt market in 2020-2021 is whether the interest rates in Europe will rise as it did in the USA a few months ago. Such an increase would affect negatively the market value of most debt securities issued at low interest rates in 2020 and early 2021.

The analysis of the yield curve should not exclude the impact of the current debt market volatility which was significant at the beginning of the COVID-19 crisis and makes the forecast for a long period of gradual market adjustment over a period of more than a year after the initial economic shock of the pandemic in Europe quite probable. The practical evidence is the possibility for arbitrage in the term structure of the yield curve, where the levels of short-term yields exceed the long-term ones. Investors' logical rational market behaviour is to take advantage of the obvious inefficiency of the market mechanism, but at the same time both investors and issuers need a certain level of liquidity, which affects their investment decisions.

We already discussed Mishkin's results regarding the possibility of using the yield curve as a tool for forecasting the real economy and inflation. This theory is confirmed by the observations of the yield curve shape and inflation expectations. The results of Mishkin's two studies provide a practical explanation of the specific shape of the yield curve with a negative slope for the first two years and positive slope beyond this period. The arguments and data described so far can be used to draw conclusions the distinction between the theoretically described possibilities for an entirely positively sloped, flat, or inverted curve. During the COVID-19 crisis, we can observe a rapid slowdown GDP growth and a decrease of the consumer spending potential although the consumer price levels are normal due to the monetary policy. This, in turn, largely eliminates any misgivings about a deflationary crisis, which causes the yield curve to slope upwards after the second year. Unlike the situation in the US, the investors in the euro area do not expect such negative scenarios about the possibilities of a higher inflation rates in the future that would depreciate the cash flows they expect from their investments. As a result, the risk premiums of government debt securities with a maturity of over two years are low and the expectations are for a stable economy in the long run according to the slope of the yield curve. However, the current situation has an extremely strong effect on the short-term end of the curve.

Conclusion

The findings of this study show that the present short-term yields do not have a particularly strong predictive capacity for the future development of the economy but can be interpreted as an indicator for investors' risk aversion and demand for liquid instruments. The shape of the yield curve is a projection of the temporary redistribution of debt portfolios with a preference to securities with the lowest possible risk. The yield curve also reflects investors' attitude to the issuers in all their descriptive aspects - economic, social and fiscal. (Petev, 2020). As of March 2021, the debt market is still affected by various investors' initial risk aversion assumed in early 2020. The market is slowly adjusting to future expectations in line with the gradual reduction of the uncertainty regarding the economic environment. In a sense, the yield curve in March 2021 is a result from investors' mistrust in the forecasts, which makes the market inefficient due to its inability to take into account the future expectations regarding the current value of tradable instruments. This inefficiency and uncertainty about future changes are the reason for the discrepancies between the term structure and the yields on government securities of the lowest-risk member states in the euro area. It is important to point out that this ambiguity stems largely from the inability to predict the development of the real economy rather than the possibility for inflation or deflation. Debt issuers put more securities into circulation, but there is no significant change in debt maturity preferences. Compared to the lowest point of the spot yield curve and the indicators based on the values of the forward curve, the forecast is that the debt market is expected to restore its normal term structure with an upwards- sloping curve in two years.

References

Barneke, B. (2006). Speech. *Reflections on the Yield Curve and Monetary Policy*. Retrieved from https://www.ecb.europa.eu/pub/projections/html/ecb.projections202103_ecbstaff~3f6efd7e8f.en.html

Bauer, M., & Mertens, T. (2018). *FRBSF Economic Letter, Research from Federal Reserve Bank of San Francisco.*

Campbell, J. Y., & Shiller, R. J. (1991). Yield spreads and interest rate movements: a bird's eye view. *The Econometrics of Financial Markets*.

ECB Statistical Data Warehouse. (n.d.). Retrieved from https://sdw.ecb.europa.eu/.

Fama, E., & Bliss, R. (1987). Information in Long-Maturity Forward Rates. *The American Economic Review, Vol.77*.

Ganchev, A. (2009). Modelling the yield curve of spot interest rates under the conditions in Bulgaria. *Economic Archive*.

Hommer, S., & Sylla, R. (2005). *A History of Interest Rates Fourth Edition.* John Wiley & Sons, Inc.

Mishkin, F. (1988a). NBER Working Paper. *What Does the Term Structure Tell Us About Future Inflation*.

Mishkin, F. (1988b). The Information in the Term Structure: Some Further Results. *Journal of Applied Econometrks*.

Mishkin, F. (1989). NBER Working Paper Series. *The Infornation In The Longer Maturity Term Structure About Future Inflation*.

Petev, B. (2020). Tax Fraud as Security Threat. *Economic Archive*(4), 70-84.

Prodanov, S. (2012). *Capital Budgeting.* V. Tarnovo: ABAGAR.

Simeonov, S. (2012). *Financial Derivatives.* Veliko Tarnovo: Abagar.

Svensson, L. (1994). IMF Working Paper. *Estimating and Interpreting Forward Interest Rates Sweden 1992-1994*.

Terziev, V., Zahariev, A., Pavlov, T., Petkov, K., & Kostov, D. (2021b). The effect of exogenous variables on P/E determinants in the context of expected post COVID-19 crisis recovery. The case of Balkan capital markets. *66th International Scientific Conference on Economic and Social Development, Rabat, 26-27 March, 2021, Economic and Social Development (Book of Proceedings). 66*, pp. 184-203. Cakovec, Croatia, 2021: ISSN: 1849-7535. doi:SSRN: https://ssrn.com/abstract=3814860

World Government Bonds. (н.д.). Извлечено от http://www.worldgovernmentbonds.com/.

Zahariev, A. (2012). *Debt Management.* V. Tarnovo: ABAGAR. doi: 10.13140/RG.2.1.4872.3607

Zahariev, A., Zveryakov, M., Prodanov, S., Zaharieva, G., Angelov, P., Zarkova, S., & Petrova, M. (2020). Debt management evaluation through Support Vector Machines: on the example of Italy and Greece.

Journal of Entrepreneurship and Sustainability, 7(3), pp. 2382-2393. doi:https://doi.org/10.9770/jesi.2020.7.3(61)

Zaloom, C. (2009). How to Read the Future:The Yield Curve, Affect, and Financial Prediction. *Public Culture, 21*(2), pp. 245–268.

Vladislav Lyubenov is a PhD student at the Department of Finance and Credit at Tsenov Academy of Economics, Svishtov, Bulgaria. **Research interests:** financial markets and quantitative financial research.

ORCID ID: 0000-0002-7761-8592

ISSN 0323-9004

Economic Archive

Svishtov, Year LXXIV, Issue 4 - 2021

Народностопански архив Година LXXIV книга 4 - 2021
Economic Archive Year LXXIV, Issue 4 - 2021

85 YEARS
DIMITAR A.TSENOV
Academy of Economics - Svishtov

D. A. TSENOV ACADEMY OF ECONOMICS
SVISHTOV

Editorial address:
2, Emanuil Chakarov street, Svishtov 5250
Prof. Andrey Zahariev, PhD – Editor-in-Chief
☎ (++359) 889 882 298
Rositsa Prodanova, PhD – technical secretary
☎ (++359) 631 66 309, e-mail: nsarhiv@uni-svishtov.bg
Blagovesta Borisova – computer graphic design
☎ (++359) 882 552 516, e-mail: b.borisova@uni-svishtov.bg

In 2021, the journal will be printed using a financial grant from the Scientific Research Fund – Agreement № KP-06-PP2-0045 from Bulgarska Nauchna Periodika – 2021 competition.

ECONOMIC ARCHIVE

YEAR LXXIV, BOOK 4 – 2021

CONTENTS