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## Book

### An introductory overview of the bond market

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## An Introductory Overview of the Bond Market

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## Abstract

This study is intended to offer the reader a basic understanding of fixed-income securities, focusing on bonds and the security's many variants that make up the debt instrument category. The report introduces multiple forms of these debt securities, with an overview of the main characteristics and a general notion of the different types of issuers and bonds. References to the local fixed-income market are also made throughout this paper, whereby one can see the number of secured and unsecured debt at the time the report was compiled, while also specifying certain local approaches in terms of accrued interest, amongst others. The report follows with a brief description of the risks faced by bondholders, concluding with a brief summary of the report.

**Keywords:** fixed-income, debt, bonds, yield, spread, interest rate, risk.

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## Executive Summary

Benjamin Franklin once suggested that “an investment in knowledge pays the best interest”, proposing that the greatest investment one can make is an investment in educating oneself through research, study and analysis, prior to making any investment decisions.

The explanation of certain bond characteristics such as the coupon, principal, maturity and yield-to-maturity are described, and serve as a foundation for the remainder of the report. The report presents the Maltese yield curve shifting throughout 2014 till 2019, with the most recent yield curve also depicting negative yielding bonds up until the 5-year maturity. This is mainly the result of the accommodative market conditions throughout the period.

Different issuers have different risk profiles and hence different spreads, which is then reflected in an assigned credit rating. Credit ratings are meant to suggest the creditworthiness associated to either an issuer or issue. As at 12 November 2019, Malta was assigned investment grade ratings by four of the most reputable rating agencies.

Provisions relating to collateral, embedded options, sinking funds and the bond’s dividend policy can be found in the bond’s indenture. The amount of secured listed corporate debt in the Maltese corporate debt market adds up to 26%. The Maltese corporate bond market, as at 30 December 2019, has approximately 13% of outstanding bonds with an embedded call clause.

Different bond structures are available to cater for the different requirements of both the issuers and the investors including those known as linkers, green bonds, and sukuk, to name a few. The main risks surrounding the bond markets are many, such as interest rate risk and credit risk. It is essential that one is aware of the various forms of risks, as they may have an adverse impact on one’s investment. Identifying such risks is essential to controlling one’s exposure, depending on their personal risk tolerance.

## 1.0 Introduction

Bonds are specialised borrowing agreements that bind a lender (investor) and borrower (issuer) that give the former a claim to periodic streams of income transferred by the borrower.

Bonds form part of a wide array of different debt obligations together with mortgage-backed securities, asset-backed securities, and bank loans, to name a few. Bonds are generally classified as fixed-income securities as they commit to an array of fixed payments to the holder of the security at predetermined dates, sometimes based on a specific calculation method (Bodie et al, 2014; Fabozzi, 2006). The other classification of fixed income securities relate to ownership in a corporation for which holders receive fixed dividend payments with priority over those made to common stockholders (Fabozzi, 2006). In cases of the issuing company going under liquidation procedures, both preferred stock and bonds take priority over common stockholders' claims to the proceeds.

Specifically, an issuer – a corporation, government agency or any other organisation – may issue bonds to raise capital as long as it satisfies the listing rules criteria of the stock exchange under which they operate.

Debt securities markets are perceived as an important development in financial markets in relation to economic prosperity. Trading allows increased flow of funds from investors to corporations for many aspects of their business against a predetermined cost of borrowing, as return for the lender (investor). Consequently, the bond market is where interest rates are determined, through the factors of demand and supply that apply to the different bonds on offer, each having their specifically assigned rate of interest according to a multitude of factors (Mishkin, 2015).

The study is divided into five sections. The first section is an introduction of the report. Section 2 outlines the main bond characteristics, which are the principal, coupon, maturity and yield-to-maturity. It also explains clauses that may be included in the bond indenture, such as sinking fund provisions, whether the debt is secured or unsecured, and if there are any embedded options. Credit ratings, calculations of accrued interest, and spreads over the risk-free rate are also included in this section. Section 3 delves into different types of bonds, which are subdivided depending on the issuer and the structure. The two main bond issuers are highlighted, together with the various types of structures a bond can have, such as fixed rate, floating rate, inflation linked, green and discount bonds. In Section 4 one can find some of the main risks associated with investing in bonds. These can range from interest rate, credit, liquidity and inflation risks. The last section concludes this report and makes suggestions to further broaden the reader's knowledge through further research on in depth performance measures and valuation tools.

## 2.0 Bond Characteristics

The basic elements and concepts pertaining to the makeup of and basic analysis of the security are here outlined, together with simplified examples throughout this section.

### 2.1 Principal

The “principal” refers to the initial amount borrowed in a loan. The principal set on a bond is the value of the bond to be paid at maturity, exclusive of interest increments paid up until the date.

### 2.2 Coupon

A coupon is the interest payment on the principal loaned that the borrower agrees to pay the bondholder every specified term, usually, annually or semi-annually. It is calculated by multiplying the coupon rate by the par value of the bond as shown in Equation 2.1 below.

$$\text{Coupon Payment} = \text{Coupon rate} \times \text{Par value} \quad (2.1)$$

The predetermined coupon rate is based on multiple considerations, namely the market interest rate and all factors pertaining to the risks of the issuer, along with its other characteristics identified in its indenture.

### 2.3 Maturity

The maturity date is a pre-specified future date on which the borrower agrees to pay back the principal worth of the bond in question to the investor, also known as the par value.

Depending on the term to maturity, bonds are either classified as “short-term” which have a maturity less than one year, and “long-term” if the maturity is that of ten years or longer. Any bonds with a maturity falling between one and ten years are referred to as “intermediate” or “medium-term” (Mishkin and Eakins, 2015). From the perspective of the government being the issuer, made available for purchase by a country’s treasury, such short-term bonds are known as treasury bills, having maturities that do not exceed 365<sup>1</sup> and measured in number of days.

A depiction of the Malta Government Stock benchmark yield curve in Chart 2.1 illustrates that longer terms to maturity reflect higher yields. This is theoretically explained by longer maturities reflecting greater uncertainty about future events. In essence, the risk on a 20-year bond poses a higher chance of undesirable events happening at some point in the term when compared to a two-year tenor, keeping everything else constant.

The term to maturity should serve as a good indication to when the full settlement should be received by the investor. It should be noted, however, that not all bonds may reach their full term. This may be due to multiple factors, such as reasons resulting from embedded options.

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<sup>1</sup> In the case of a leap year, the maximum amount of days total to 366.



## 2.4 Yield-to-Maturity

These basic elements are used to calculate a bond's return until maturity, known as the bond's yield to maturity or more simply, the yield. Therefore, the yield measures the total return a bond will provide the investor from the day of purchase until maturity. This measure is composed by making use of the coupon rate, term-to-maturity and price, as illustrated in the formula below.

A simple formula to calculate the yield to maturity, which has been used in the formulation of Table 2.1, is given by the following equation:

$$\text{Approx YTM} = \frac{\text{Coupon} + \left[ \frac{\text{Face Value} - \text{Price}}{\text{years till maturity}} \right]}{\left[ \frac{\text{Face Value} - \text{Price}}{2} \right]} \quad (2.2)$$

The yield-to-maturity (i.e. yield) on a highly credit worthy sovereign bond, like that of the U.S. and Germany, is referred to as the risk-free rate. The risk-free rate is widely used as a benchmark to compare with other bonds, whereby one can analyse the difference, or spread, between the yield on the bond being studied and the risk-free rate. One can also use the yield on the risk-free rate to discount future cash flows on riskier instruments.

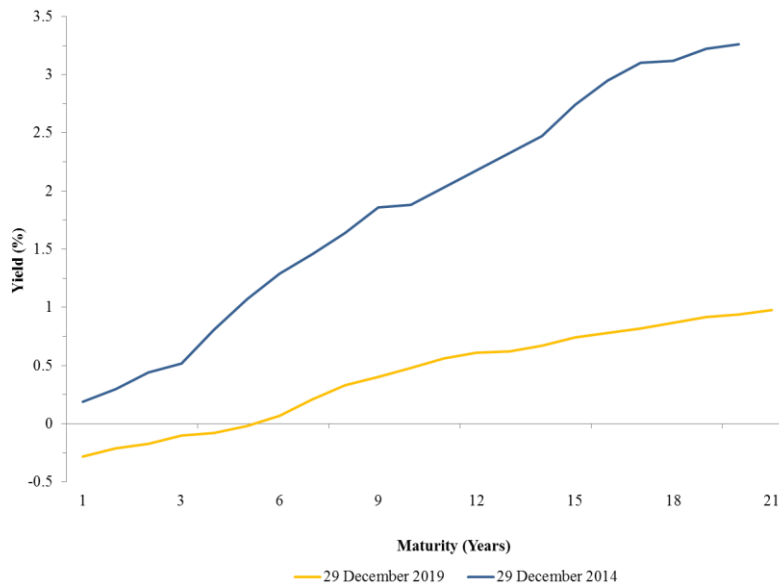
**Table 2.1 - Prices and Yields to Maturity**

Term to Maturity	Coupon Rate	Yield (%) at Par Value € 100	Yield (%) at € 95.00	Yield (%) at € 105.00
1 year	1.1	1.1	1.15	1.05
2 years	1.2	1.2	1.25	1.15
5 years	1.5	1.5	1.55	1.45
10 years	2	2	2.05	1.95

*Source: Authors' Calculations*

As illustrated in Chart 2.1 – where as opposed to the yield levels of 2014, the current yield curve is below the zero level – negative yielding bonds are present given the current market conditions, whereby they guarantee a loss if they are held until maturity. Simply put, the premium paid by the investor is more than the total interest payments over the life of the bond, hence generating a negative total return.

**Chart 2.1: Maltese Yield Curve**



Source: CBM

Although the three elements mentioned are crucial yield determinants, different bonds can vary from one another on a number of counts which in turn affect their attractiveness and yield. These varying aspects of individual bonds would primarily reflect the issuers' needs through the underlying agreements of the bond, and their fundamentals.

## 2.5 Spreads over Risk-free Rate

Consider a simplified case presented in Table 2.2, which is intended to give a rundown of what is meant by the spread over the risk-free rate. Different bonds have different spreads over the risk-free rate depending on a multitude of factors, one of which portrayed in the example below is different terms to maturity.

It is assumed that the respective risk-free rates are of 0.2% and 0.8% which were merely set for illustration purposes. The set spread over the risk-free rate is kept constant for both scenarios, however increases across the terms to maturity. Thus for the one-year issue, a spread of 0.3% or 30 basis points over the risk-free rate of 0.2% yields a 0.5% yield for the said issue, as the former is added on top of the latter to arrive at the final yield. All other results in Table 2.2 follow the same methodology to arrive to the final yield.

**Table 2.2 - Spread on Maturity**

Term to Maturity	Spread	Risk Free Yield of 0.2% (%)	Risk Free Yield of 0.8% (%)
1 year	0.3	0.5	1.1
2 years	0.4	0.6	1.2
5 years	0.7	0.9	1.5
10 years	0.9	1.1	2

Source: Authors' Depictions

The yield to maturity is equal to the coupon rate when the bond would be trading at par value. In instances where the security is being bought at a premium (redeemed at par) the yield would be less than the coupon rate. Conversely, buying the bond at a discount results in a higher return for the investor, as together with the coupon payments being calculated on the full par value, the investor would also gain from the capital appreciation upon maturity. Returning to Table 2.1, two examples illustrate a discount of €5 from par value of €100, and a premium price of €105, €5 over the par value.

## 2.6 Accrued Interest

When selling bonds on the secondary market there is what is known as accrued interest. This is the cumulative daily interest between coupon payments. If a bond is sold before its maturity and between coupon payments, the seller would be entitled to the bond's trading price together with the accrued interest that the bond has accumulated up until the selling date.

Since the issuer pays the coupon for the whole period, the holders are only known at a specified date. The period prior to such date is known as the cum-div period meaning "with dividend" whilst the period after the specified date is then known as the ex-div period.

The cum-div period starts right after a coupon payment is made and, in the case of Malta Government Stock, ends twenty-one calendar days prior to the next coupon payment. Since the buyer would feature in the issuer's list, the seller's entitled accrued interest would be embedded in the total payment made by the buyer.

If the bondholder opts to sell the bond during the ex-div period, he will be entitled for the accrued interest up until the selling date, but given that he will receive the full coupon payment from the issuer on the pre-specified coupon day, he will have to reimburse the buyer. The buyer's entitled accrued interest would be deducted from the total payment the seller is entitled to receive. Close to maturity, the bond would simply be suspended from trading in the aforementioned period.

## 2.7 Credit Ratings

To facilitate the credit worthiness assessment of an issuer, a credit rating scheme is assigned based on multiple factors. Credit ratings are a means to partly identify the risk premium offered on bonds as they assess the credit risk of individual issuers. Therefore, credit ratings reflect the creditworthiness or the associated risk assigned to an issuer of securities or any company, government or entity that opts for the service. The credit rating reflects the likelihood that the borrower will meet his obligations on time and in full, without defaulting, which would translate into a high credit rating. On the other hand, low credit ratings reflect past issues of repayment by the issuer and that would be likely considered to follow the same pattern in the future.

The ratings are usually based on an evaluation made by an independent body for a fee by the entity seeking the credit rating for itself or for its issued securities. For example, the highest rating given by Standard & Poor's is a AAA rating. A speculative grade or otherwise known as junk bonds have a rating lower than BBB-, implying a relatively higher likelihood of defaulting on its obligations. A list of the credit ratings given by the four major agencies can be found in Table 2.3.

**Table 2.3: Credit Ratings and Description**

	<b>S&amp;P</b>	<b>DBRS</b>	<b>Fitch</b>	<b>Moody's</b>
<b>Prime</b>	AAA	AAA	AAA	Aaa
<b>High Grade</b>	AA+	AA+	AA+	Aa1
	AA	AA	AA	Aa2
	AA-	AA-	AA-	Aa3
<b>Upper Medium Grade</b>	A+	A+	A+	A1
	A	A	A	A2
	A-	A-	A-	A3
<b>Lower Medium Grade</b>	BBB+	BBB+	BBB+	Baa1
	BBB	BBB	BBB	Baa2
	BBB-	BBB-	BBB-	Baa3
<b>Non-Investment Grade Speculative</b>	BB+	BB+	BB+	Ba1
	BB	BB	BB	Ba2
	BB-	BB-	BB-	Ba3
<b>Highly Speculative</b>	B+	B+	B+	B1
	B	B	B	B2
	B-	B-	B-	B3
<b>Substantial Risk</b>	CCC+	CCC+	CCC+	Caa1
<b>Extremely Speculative</b>	CCC	CCC	CCC	Caa2

*Source: Deniz, Basar and Genc (2019)*

The renowned credit rating agencies include Standard & Poor's (S&P), Moody's, DBRS, and Fitch. As at 12 November 2019, Malta was assigned investment grade ratings by all the aforementioned rating agencies. In Table 2.4, one can note the credit rating of other Euro area countries.

**Table 2.4: Euro Area Credit Ratings**

<b>Sovereign</b>	<b>S &amp; P</b>	<b>DBRS</b>	<b>Fitch</b>	<b>Moody's</b>
Austria	AA+	AAA	AA+	Aa1
Belgium	AA	AAH	AA-	Aa3
Cyprus	BBB-	BBBL	BBB-	Ba2
Estonia	AA-	AAL	AA-	A1
Finland	AA+	AAH	AA+	Aa1
France	AA	AAA	AA	Aa2
Germany	AAAu	AAA	AAA	Aaa
Greece	BB-	BBL	BB-	B1
Ireland	AA-	AH	A+	A2
Italy	BBB	BBBH	BBB	Baa3
Latvia	A	AL	A-	A3
Lithuania	A	A	A-	A3
Luxembourg	AAA	AAA	AAA	Aaa
Malta	A-	AH	A+	A2
Netherlands	AAA	AAA	AAA	Aaa
Portugal	BBB	BBBH	BBB	Baa3
Slovakia	A+	AH	A+	A2
Slovenia	AA-	A	A	Baa1
Spain	A	A	A-	Baa1

*Source: Refinitiv; Trading Economics*

## 2.8 Bond Indentures

A bond is issued with an indenture, or contract, which lays out in detail the promises made by the issuer to the bondholders together with the latter's rights. Indentures cover a set of restrictions and limitations on the borrowers' activities, termed as negative covenants that protect the rights of the bondholders. These include provisions relating to collateral, sinking funds, dividend policy, and further borrowing by the issuer unless certain criteria are satisfied. Bond indentures are regarded as another safeguard to protect the claims of bondholders.

Restrictions, known as covenants, may be found in the bond's indenture to protect the rights of the bondholders (Bodie, Kane and Marcus, 2014). Covenants are classified into two sets – (i) affirmative and (ii) negative covenants, where the former are promises made by the issuer, whilst the latter relate to restrictions on the borrower's activities. An example of an affirmative covenant would be to pay the interest and principal on a periodic basis and to maintain all properties that are useful to the issuer's business in good condition. Meanwhile, a negative covenant for instance may be one that limits the issuer to add on additional debt unless certain tests are carried out (Fabozzi, 2006).

## 2.9 Sinking Fund

A sinking fund is essentially a pool of funds set aside by a company for the purpose of repaying previously-issued debt. There may be what is referred to as a “sinking fund requirement” which effectively requires the issuer to retire a specified portion of the issue each year (Fabozzi, 2006).

Reasons for creating a sinking fund could be numerous. For instance, the issuer may wish to decrease the probability of the company becoming constrained in its cash resources. Thereby, the company would then strategically pay off a portion of its outstanding debt each year with the sinking fund. This would ensure that at the end of the respective bond’s maturity it will face a much smaller debt burden, reducing the possibility of a cash flow crisis, which will eventually result in a lower financing risk (Bodie, Kane and Marcus, 2014).

The periodic repurchase of outstanding bonds will occur at either a predetermined sinking-fund price which is usually the bond’s par value, or the prevailing market price. The issuer usually buys back bonds when the interest rate falls. As a result, with this indenture in place, it allows the issuer to buy back their bonds at a lower price than what is being traded on the market.

A sinking fund is therefore also advantageous to the issuer and lowers the risk of default, which in turn is reflected in a lower coupon rate as it becomes more attractive to a risk-averse investor (Mishkin and Eakins, 2015).

Sinking funds are not popular amongst local issuers; very few issuers have established such a fund with financing debt securities as its purpose.

## 2.10 Secured/Unsecured

Bonds can be either secured or unsecured by the issuer. Secured bonds are generally those backed or collateralised by an asset (money or physical asset). Conversely, debt not pledged by collateral is unsecured.

Corporate bonds may be secured or unsecured whilst sovereign bonds are generally unsecured and backed by the “creditworthiness” of the issuer (government). Secured bonds are perceived by investors as a safer investment and typically pay lower interest rates. In theory, in the case of default a secured bond grants the investor a claim on the underlying assets, to receive back their money. The claim, however, is sometimes challenged.

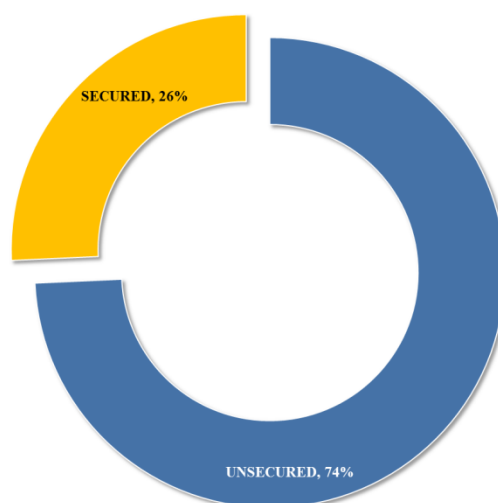
The majority of domestic corporate bonds are unsecured debt. Whilst it is specified in the majority of the prospectuses that the bonds would rank *pari-passu* with other unsecured debt obligations, it is also noted that they would rank below other debt deemed of greater seniority<sup>2</sup>.

As shown in Chart 2.2, only 26 per cent of the listed corporate debt is secured. Securing debt issues is seen by many as necessary for certain companies that are deemed to be of higher risk, to make the issue more attractive, especially in the absence of credit rating scores of domestic firms.

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<sup>2</sup> Seniority refers to the repayment priority in an event such as bankruptcy.

**Chart 2.2: Proportion of Secured and Unsecured Maltese Corporate Debt**



*Source: Malta Stock Exchange*

### **2.10.1 Debentures**

Unsecured bonds are also referred to as debenture bonds, whereby the issuer promises to repay the debt based on the "full faith and credit" of the issuer. Although a debenture bond is not secured by a specific pledge, the debenture bondholders have the claim of general creditors on all the assets<sup>3</sup> held by the issuer. They also have a right on pledged assets after all higher-graded investors in the capital structure have been paid (Fabozzi, 2006). Unsecured bonds can also be referred to as "subordinated" or junior debt, normally carrying more risk than secured bonds. In such a case, the reputation and credit worthiness of the issuer are key.

A debenture is considered one of the most common forms of long-term loans undertaken by a company. These loans can either be issued with a fixed or floating interest rate although the majority are issued with a fixed rate and are usually repaid on a specific date. These securities can also be irredeemable, sometimes referred to as perpetual bonds.

In general, debentures are issued to raise capital which typically has a more specific purpose than other bonds, and the funds raised are used to meet the expenses of an upcoming project or to pay for a planned expansion in business. They are also called revenue bonds as the issuer anticipates repaying the loan from the proceeds of the business project.

## **2.11 Embedded Options**

An embedded option is generally a right given to either party to take action in their own interest and is embedded within the issue. Such provisions are clarified in the indenture of the issue (Fabozzi, 2006). Therefore, embedded options can be of two general types, those granted to issuers and those granted to the

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<sup>3</sup> Excluding those assets that are securing any other debt.

bondholders. The Maltese corporate bond market, as at 30 December 2019, has approximately 13% of outstanding bonds with an embedded call clause<sup>4</sup>.

The most common types of options are presented in Table 2.5, indicating whether the right is held by the bond issuer or the holder. Note that the higher coupon bearing bonds are associated with options that grant the issuer the right to exercise it, since investors need to be compensated for the higher risk, whilst the converse also holds.

**Table 2.5: Embedded Options**

<b>Option</b>	<b>Description</b>	<b>Right to Issuer</b>	<b>Right to Holder</b>
<b>Call</b>	A right to call the issue	✓	
<b>Put</b>	A right to put the issue		✓
<b>Conversion</b>	A right to convert the security to equity		✓
<b>Cap</b>	Limiting possible interests paid to a maxima	✓	
<b>Floor</b>	Limiting possible interests paid to a minima		✓
<b>Principal Pre-payment</b>	A right to prepay principal before scheduled principal payments	✓	
<b>Accelerated Sinking Fund</b>	Allows issuer to retire more into the fund than what would be required by the provision	✓	

*Source: Authors' Depictions*

The creation of embedded options has from one aspect hindered the predictability of future payments, resulting in bonds becoming more complex. Options may therefore complicate matters in terms of valuation. Valuation would firstly require one to model factors that affect the likelihood of the option holder to exercise their right over the term of the security. Following this step, for a more precise estimate, one could model behaviours of the option holder to determine the necessary scenarios under which they would be inclined to exercise their right (Fabozzi, 2006).

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<sup>4</sup> The data is excluding corporate bonds that fall under the prospects market.



### 2.11.1 Convertible Bonds

Convertible bonds give the right to a bondholder to transform each convertible bond to a number of shares specified by a pre-set conversion ratio. These provide bondholders with an option to exchange each bond for a specified number of shares of common stock of the firm.

Taking an example of a bond with par value of €100 which is convertible to a total of 10 shares of a firm's common stock, Table 2.6 shows when it would be optimal for a holder of a convertible bond to exercise their right to the option.

**Table 2.6: Convertible Bonds Actions**

Bond Par Value (€)	Shares	Price (€)	Value of Shares (€)	Gain/Loss (€)	Action
100	10	8	80	-20	✗
100	10	12	120	20	✓

*Source: Bodie, Kane and Marcus, 2014; Authors' Depictions*

The conversion premium, that may be available to the bondholder in times when stock prices exceed the bond's market price, is the main deciding factor toward a conversion decision. Taking the second scenario of Table 2.6, the conversion premium results to €20, when the bonds are traded at par value, if all remains constant and the bond trades at a discount price of €93, the conversion premium would increase to €27.

Convertible bonds give more opportunity to the bondholder to make a gain on investment, increasing their flexibility to do so with the indenture. Consequently, convertible bonds would offer lower coupon rates and yields to maturity, when compared to conventional bonds (Bodie, Kane and Marcus, 2014). The Maltese bond market, as at the end of December 2019, has no convertible bonds in circulation.

### 2.11.2 Callable Bonds

A call option set out in a bond's indenture gives the issuer the right but not the obligation to repurchase the bond, otherwise known as "call", from the bondholder. The call would be done at a predetermined price, known as the "call price", and at a predetermined time, known as the "call date". A variant of callable bonds are deferred bonds, which would have a call-protection period, in which the bonds cannot be redeemed by the issuer.

The intuition behind the call option is to allow the issuer the opportunity to refinance at a lower cost, if the opportunity presents itself. This case is most likely to present itself during a downturn in market interest rates whilst having high coupon rates set on the existing bond. In other words, when the coupon on a callable bond is higher than the market rate, assuming there is no call protection period, then it is probable that the issuer calls the bond to reissue the same outstanding amount at a lower coupon rate.

The risk faced by the bondholder, on the other hand, is of having their security called by the issuer, and reinvesting the proceeds at a lower coupon rate, thereby not achieving the entire yield forecasted for the period. The added risk borne by the investor would then be reflective in higher coupons and, consequently, yields to maturity, at issuance.

The price of a callable bond is measured by subtracting the price of the embedded call option from the price of an option free bond, as illustrated in Equation 2.3. The value of the option is dependent upon the expected yield volatility. Given the positive relationship between volatility and the price of an embedded option, the greater the expected yield volatility, the lower the price of the callable bond. Hence, a higher yield would be priced-in as compensation for the higher volatility (i.e. higher risk)<sup>5</sup>.

$$\text{Price of Callable Bond} = \text{Price of Option Free Bond} - \text{Price of Call Option} \quad (2.3)$$

### 2.11.3 Putable Bonds

The put bond gives what is called a put option, which grants the bondholder the right to receive earlier repayment of the principal. Thus, the bondholder holds the right, but not the obligation, to put the bond up for sale within a specific time period and at a predetermined price. The put option is of benefit to the bondholder as it provides the investor with added flexibility in managing their investments. As opposed to a call option, the price of the embedded option is added to the price of an option free bond, in order to determine the price of the putable bond, as illustrated in Equation 2.4 below. In the event where yield volatility is expected to decline, the price of the putable bond would subsequently decline as well<sup>6</sup>.

$$\text{Price of Putable Bond} = \text{Price of Option Free Bond} + \text{Price of Put Option} \quad (2.4)$$

An example of how the investor may exercise his right is to put the bond when the coupon rate would be too low in comparison to the current market yield. This would free up the invested funds by the said bond to be reinvested in higher yielding investments. On the other hand, it would be of greater benefit to the investor not to demand earlier repayment when the coupon exceeds the current market yield.

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<sup>5</sup> Higher yield volatility results in a higher risk and probability of the call option being exercised. When the call option is exercised, this is done in favour of the issuer. Hence, the bond holder would subsequently demand a higher yield and therefore would be willing to pay a lower price for the bond, when faced with higher yield volatility expectations.

<sup>6</sup> Since the right to exercising the option is at the discretion of the bondholder, higher yield volatility would be favourable for the investor. Greater volatility means there is a higher probability that yields rise, and hence the investor would exercise the option. With increased volatility, the issuer would be taking on relatively higher risk, ergo a lower yield and a higher bond price would be set in the offering of a put option.

## 3.0 Types of Bonds

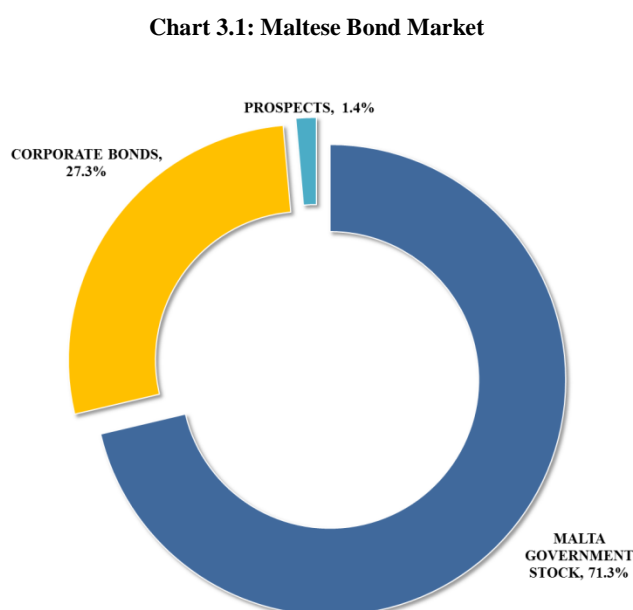
### 3.1 By Issuers

Primarily, bonds are distinguished from one another depending on the issuer of the bond. Issuers could be classified into particular subsets as they share very similar attributes, which in turn contribute to the risk that the bonds pose to their prospective investors. The two largest subsets of bonds include government debt and corporate issuances.

#### 3.1.1 Sovereign Bonds

Sovereign bonds are issued by countries' governments and are therefore secured by the government's assets. The coupons associated with such bonds, particularly those issued by the U.S. Treasury, are considered as risk-free<sup>7</sup> rates (Fabozzi, 2006; Mishkin 2015).

Sovereign bonds, in most countries, make up the largest proportion of the bond market. This is reflected also in the case of the Maltese bond market, which is made up of three subsets: MGS market, Corporate Bonds market, and Prospects market<sup>8</sup>, with their respective percentages shown in Chart 3.1 below. The data was compiled as at end of December 2019.



*Source: Malta Stock Exchange*

<sup>7</sup> Void of credit risk.

<sup>8</sup> Prospects are another form of corporate bonds with specific listing rules applied to small-to-medium enterprises. For the purposes of this report, prospects are treated as a separate security and are not included in the analysis, unless otherwise specified.

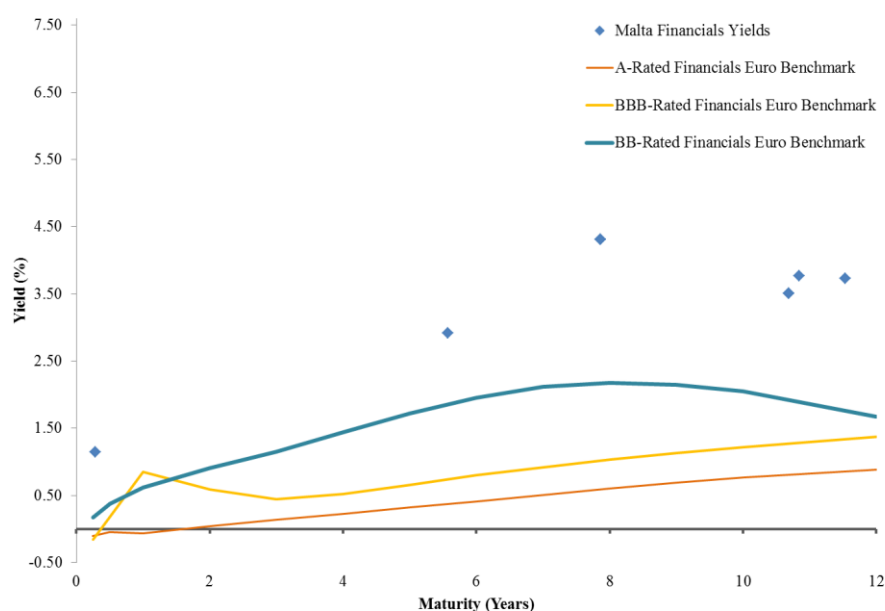
Returns in sovereign bonds have been widely researched. Results from a study by Dimson et al. (2009) after analysing over a century of data (1900-2009) suggest that overall returns averaged out to 5% per year during the period. However, as aforementioned, the return on such bonds is widely dependent on the interest rate environment of the period in question.

### 3.1.2 Corporate Issuers

Corporate fixed-income issuances provide companies the opportunity to raise funds needed by the organisation through the debt securities market. Some corporate bonds, unlike those issued by sovereigns, may give the investor the option to convert their holdings into shares of the company, through a convertible option (Bodie, Kane and Marcus, 2014).

Corporate bonds differ from those issued by governments, primarily, in terms of risk. In contrast to government bonds which are considered to have minimal risk of default, corporate bonds do not provide such peace of mind to their prospective investors. This added risk forms one of the many factors that are considered in the calculation of the compensation given to holders of such bonds through a higher yield in comparison to sovereign bonds. Therefore, the characteristics of the bonds together with the issuing company's associated risk are in general bound to give a higher return in comparison to those issuances of the state (Mishkin, 2015; Mishkin and Eakins, 2015). The interest rates assigned to corporate bonds are therefore based on a rating scheme that assesses the credit-worthiness of the firm. Bonds with higher ratings are considered to be safer than those with lower ratings, and therefore, the former are associated with lower interest rates than the latter (Mishkin and Eakins, 2015).

**Chart 3.2: Rated Euro Benchmark Financials and Domestic Financial Bonds**



*Source: Refinitiv; Authors' Calculations*

Through Chart 3.2, one can note that an A rated euro area financial company, will yield an investor a lower return than a lower rated company. The spread between the benchmark yield curves, where the majority of the constituents are large banks, is the compensation for the additional credit risk an investor undertakes when investing in a lower credit rated company.

The yields of corporate bonds issued by Maltese banks were subsequently plotted on the same chart. Since the majority of these domestic corporate bonds are unrated, this chart presents us with a visual representation of where the market is pricing these financial instruments in comparison to the euro area financials credit curves, as at December 2019. The chart is indicating that these Maltese corporate bond yields are higher than the benchmark representing BBB euro area financial companies. One can attribute this difference to a number of factors, including an element of uncertainty when analysing the credit risk of the respective bank, which bring with it an additional cost for an investor to monitor the corporate, ergo a higher cost of borrowing. Also, the relatively small size of the Maltese market may potentially translate into higher liquidity risk, which may be captured in the positive spread on the benchmarks.

## 3.2 By Structure

### 3.2.1 Fixed Rate Bonds

A fixed-rate bond is a type of debt security, which pays the same coupon payment at a pre-determined schedule. The issuer of this financial instrument is obligated to pay out a regular stream of income over the life of the bond, with the par value being repaid at maturity. Coupon payments are computed by taking the coupon rate and multiplying it by the par value of the bond. Investors can accurately forecast the total return to be generated by the fixed-rate bond, as well as the timing of the payments. The present bond value can be found by discounting the cash flow (i.e. interest payments) and par value by the respective interest rates, as illustrated in the below formula.

$$\text{Bond Value} = \sum_{t=1}^T \frac{\text{Coupon}}{(1+r)^t} + \frac{\text{Par Value}}{(1+r)^T} \quad (3.1)$$

Where  $r$  is the interest rate,  $t$  is the time till next coupon payment, and  $T$  is the full term to maturity. Nonetheless, the interest payments and par value of the fixed rate bond are not guaranteed, and can be affected by a number of risks. The payments are mainly dependent upon the solvency of the issuing party. Credit risk is not the only risk of fixed-rate bonds, as these debt instruments are also exposed to interest rate risk. This is due to the negative relationship between bond prices and interest rates. Since the rate of interest is fixed, should interest rates increase, the bond would be less attractive to other investors that can purchase higher yielding debt instruments. The lack of interest in this specific bond would result in a declining bond price, as more investors are willing to sell the bond rather than purchase it.

### 3.2.2 Floating Rate Bonds

Floating rate bonds have a variable interest rate that fluctuates according to a chosen market interest rate benchmark, known as the reference rate. A floating rate of London Interbank Offered Rate (LIBOR) + 2%, will pay out 3% if the LIBOR is equal to 1% on the adjustment date. Interest rate risk<sup>9</sup> is minimised through such an instrument, as it is only endured up until the next reset period which can range from daily to yearly. Hence, floating rate bonds are lucrative to investors that expect a rise in

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<sup>9</sup> Explained further in Section 4.1.

interest rates. Contrarily, these debt instruments are not as attractive to investors that expect interest rates to decline.

As part of its debt management strategy, the Treasury of Malta opted to issue a series of floating rate bonds, starting in 2009. The first bond was issued with a term to maturity of six years, linked to the movements of the 6 month Euribor plus a spread of 80bps. This bond offered the prospective investor a cushion to fluctuations in interest rates, being covered by both the cap and floor options. As previously mentioned the latter offers a limit on the minimum interest paid and the former provides a ceiling on a possible increase in interest.

For the aforementioned reasons, the performance of a floating rate bond is less related to the financial conditions of the issuer. The coupon rate adjusts based upon changes in the overall level of market interest rates. That being said, should the financial health of the underlying company decline, the instrument would become less attractive, resulting in a lower price and a higher yield to compensate the investor for the additional risk (Bodie, Kane and Marcus, 2014).

Investors can also make use of inverse floaters or reverse floaters, whose coupon rate is inversely related to a benchmark rate. An inverse floater would be an ideal debt instrument for investors that want to hedge against the risk of falling interest rates. To prevent a negative coupon rate from occurring, a coupon rate floor is used.

### **3.2.3 Inflation Linked Bonds**

An inflation-linked bond, or linker, is a fixed income security in which the principal and coupons are linked to a specific price index. The scope behind a linker is to safeguard the purchasing power of the investor over the bond's whole term. The coupon rate specified in the prospectus is fixed, however, the principal is periodically adjusted dependent upon the price index employed. This results in an inflation adjusted coupon payment (Farrugia et al, 2018).

Linkers offer numerous advantages to both issuers and investors. Mainly, inflation-linked bonds lower the cost of borrowing for the issuer which is explained by the lower inflation risk faced by investors (Westerhout and Ciocyte, 2017). Over the long-term, linkers were also found to have a low correlation with traditional bonds and stocks, offering both the issuers and investors the advantage of diversifying their respective portfolio and investor base. It is important to mention that such an instrument also has some challenges, such as the index lag, which might not be able to accurately reflect the true cost of living through the respective price index.

### **3.2.4 Discount Bonds**

Discount bonds are debt instruments which are issued and traded below their par value. The yield-to-maturity on a discount bond is higher than the coupon rate, which is attributable to the bond trading at a sub-par price.

A zero-coupon bond is a common example of a discount bond. Since it does not pay out any coupons, the return on this instrument is completely generated through capital appreciation, realised in full at maturity. Considering that the bond is redeemed at par value, it should therefore sell at a discount to compensate the investor for the time value of money. However, in the current negative interest rate environment one can also witness yields on zero-coupon bonds lower than the coupon rate being offered, which is uncommon.

Zero-coupon bonds also have a higher duration (i.e. they are more sensitive to interest rate risk) when compared to a traditional bond. So, in the case of a zero-coupon bond there is only one payment at maturity, making these debt instruments highly sensitive to changes in interest rates.

### 3.2.5 Green Bonds

Green bonds are becoming increasingly popular with each passing year. The issue of global warming continues to be a central topic of discussion amongst world leaders and policy makers, highlighting the gravity of the environmental situation that the world finds itself in. Through increased awareness of such events, people have developed a growing concern for the environment and for other social issues. The creation of green bonds, which refer to any type of bond instrument, has thus provided a means to earmark the raised funds by the issuer toward financing or to re-finance eligible Green Projects (ICMA, 2018).

According to the Assessment of Market Practice and Regulatory Policy report published by International Capital Market Association (ICMA), the green debt market grew substantially, reaching \$159.49 billion as at the end of the third quarter of 2019. In comparison to the same quarter of the previous year, the market for green bonds experienced significant growth of 37%. Green bond supply from corporates and Sub-Sovereign, Supranational and Agency (SSAs) has grown remarkably year-on-year, by 73% and 31% respectively (ICMA, 2019). The total figure continued to climb by 59.82%, to close the year at a total of \$254.9 billion (Climate Bonds Initiative, 2020).

Visual comparisons of yields associated to sovereign green bonds<sup>10</sup> and their corresponding conventional bonds are presented in Charts A.1 and A.2 in the Appendix. Both charts depict a clear correlation between the two instruments. Both green bond yields have a positive spread above that of their conventional bond counterparts which may be attributable to a liquidity premium present in the green bonds yield. The smaller outstanding amount of the country's respective green bond, amongst other potential factors, may be reflected into higher green bonds yield when compared to that of the corresponding conventional bond. As Chacko et al (2005) indicate, the greater the issue size of a bond, the more liquid the bond is. Hence, as economic theory suggests, the lower the liquidity the higher the yield will be to compensate the investor for the additional liquidity risk.

### 3.2.6 Sukuk Bonds

Sukuk bonds are ones that specifically target Islamic investors. They closely mimic all the attributes of a conventional bond, such that they return periodic income flows to the holders. These bonds differ from conventional bonds on the basis that they are financial certificates that give the holders partial ownership of some other debt or asset (Visser, 2009).

Different types of Sukuk bonds exist, the most common of which sells assets such as property to a special purpose vehicle which would issue certificates of ownership to bondholders. These are called Ijara and are also traded on the secondary market. Other types of Sukuk bonds include Mudaraba, Musharaka, Murabaha and more, all revolving around contracts with different means of securing the debt instruments, that will render the investor a fixed return.

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<sup>10</sup> The issuances are those made by France and The Netherlands.

Sukuk bond issuers do not necessarily have to be of Islamic origin. Western countries such as Germany and the United Kingdom have issued sovereign Sukuk bonds with their first issues being in 2004 and 2014, respectively (Deloitte, 5<sup>th</sup> Edition)<sup>11</sup>.

## **4.0 Risks Associated with Investing in Bonds**

### **4.1 Interest Rate Risk**

The risk of being adversely impacted by a change in the level of interest rates is known as interest rate risk. The magnitude of the impact on the bond is dependent on the duration of the debt instrument. Typically, bond prices are inversely related to interest rates. When interest rates rise, fixed rate bond prices should decline as newly issued instruments offer a higher return, making the lower return bonds less attractive. Since the coupon rate of a fixed-rate bond does not adjust, the price will have to decline in order to offer a higher yield/ return, aligned with that of the market.

### **4.2 Reinvestment Risk**

The coupon payments generated from a fixed-income security are reinvested at the prevailing market rates. Hence, if one invests in a fixed-rate bond that pays out 4% per annum, and market interest rates fall to 2%, the income generated by the instrument is invested at a lower rate thereby affecting the total forecasted return of the instrument.

### **4.3 Credit Risk**

Credit risk can be subdivided into 3 categories:

#### ***i. Default Risk***

Should an issuer fail to make an interest or principal payment, in the specified period, the issuer would be in default on its obligations. Hence, the probability of default is determined by the credit worthiness of the issuer. A default does not necessarily mean that the investors would lose all invested funds, as some of the funds may be recovered, known as the recovery rate.

#### ***ii. Credit Spread Risk***

The yield on a bond is composed of the risk-free rate plus a risk premium, attributable to the specific risks of the bond. In the event of a recession, one can usually observe a flight to safe and liquid assets, such as U.S. Treasury securities (i.e. risk-free assets). This means the yield on these safe instruments will fall, while the yield on debt issued by corporations tends to rise as a consequence, resulting in a wider credit spread. This widening in the credit spread results in a fall in the price of riskier debt-securities.

#### ***iii. Downgrade Risk***

Rating agencies issue credit ratings based upon the probability of default on a specific issue. One can distinguish between high grade or investment grade ratings, and non-investment grade bonds or high

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<sup>11</sup> See: <https://www2.deloitte.com/content/dam/Deloitte/xs/Documents/financial-services/me-Islamic-finance-corporate-sukuk-in-europe.pdf>



yield bonds. Credit ratings can subsequently get upgraded or downgraded. If an issue or issuer gets downgraded, this information is reflected in the widening of the credit spread which would result in a fall in the price of the debt instrument.

#### 4.4 Liquidity Risk

An investor that would like to sell a bond at the quoted price, who is however unable to find any counterparties to trade with, faces liquidity risk. The main repercussion arising from this risk is having to accept a price concession which is usually reflected in a wider bid-ask spread. A wide bid-ask spread factors the liquidity premia of the instrument, which is why investor may use it to interpret the liquidity risk associated with a particular financial instrument.

#### 4.5 Inflation Risk

All debt instruments, except for inflation-linked bonds, are exposed to inflation risk. If investors are demanding a 3% real yield and inflation expectations are currently 2%, then the nominal yield would have to be 5% (3% + 2%). This is popularly known as the Fisher hypothesis, which states that the nominal yield is equal to the summation of the real yield and inflation expectations, as illustrated in the below formula.

$$\text{Nominal Rate} = \text{Real Rate} + \Sigma(i) \quad (4.1)$$

$$\Sigma(i) = \text{Inflation Expectations}$$

In the event where inflation expectations increase, the nominal yield would also have to increase in order to compensate investors for the loss in purchasing power. Hence, if inflation expectations rise to 3%, investors would opt to sell bonds that yield less than 6%, therefore the bond price would decline in order to adjust the bonds yield to the 6% level.

#### 4.6 Market Risk

Market risk is also known as systematic or undiversifiable risk. Examples of market risks are usually identified as “black swan” events, meaning the event was unpredictable at the time it occurred with potentially severe consequences. Political turmoil, recessions, natural disasters, terrorist attacks and other similarly unexpected events, are examples that can adversely impact market prices.

## 5.0 Conclusion

It is clear that there are many facets to fixed income securities. The different types of bonds were created in order to cater for the diverse needs of both investors and issuers. A basic understanding of these bonds and their dynamics should guide the reader to explore in further detail these financial products. Awareness to risks and comprehension of the activity and repercussions of financial markets on private and public investments is suggested prior to investing.

To this end, it should be noted that the explanations given in this report do not equip individuals with the skills of trading in such instruments. Further research on aspects such as performance measures, and appropriate valuation tools, together with sensitivity analysis and simulations is recommended prior to trading.

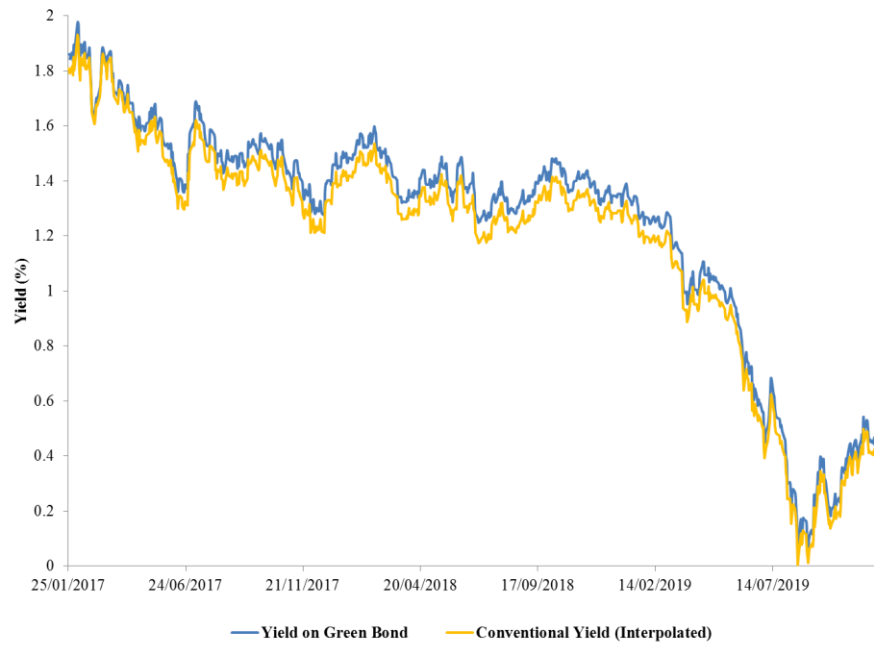
Bonds may be preferred by investors and portfolio managers for income generation and diversification purposes (McIntosh and Murik, 2012). When it comes to seniority, a company's debt instruments typically rank superior to its equity, making bonds more lucrative in situations where the company is facing turbulence. Sovereign bonds are typically perceived as less risky to corporate debt, and therefore tend to be used as benchmarks. Hence, this implies that bonds may be more suitable options for risk averse investors (Attaoui and Six, 2015), and may be used as a complementary financial instrument to enhance the risk adjusted returns of a portfolio.

## 6.0 References and Bibliography

- Attaoui, S. and Six, P. (2015). The Impact of Different Risk Aversions on the Bond-Stock Mix: A Note. 85-112 Vol.36 No.3.
- Bodie, Z., Kane, A. and Marcus, A. (2014). Investments. 10th ed. New York: McGraw-Hill Education.
- Farrugia, M., Formosa, G. and Pace, J.J. (2018) Inflation-linked Bonds: An Introduction. Central Bank of Malta WP/05/2018.
- Chacko, G. and Mahanti, S. and Mallik, G. and Subrahmanyam, M.G., The Determinants of Liquidity in the Corporate Bond Markets: An Application of Latent Liquidity (December 2005). NYU Working Paper No. S-DRP-05-08. Available at SSRN: <https://ssrn.com/abstract=1295844>
- Climate Bonds Initiative (2020). Green Bonds Market 2019. Available at: <https://www.climatebonds.net/>
- Deloitte, (5th Edition). Corporate Sukuk in Europe, Alternative financing for investment projects. Available at: [https://www2.deloitte.com/content/dam/Deloitte/xs/Documents/financial-services/me\\_Islamic-finance\\_corporate-sukuk-in-europe.pdf](https://www2.deloitte.com/content/dam/Deloitte/xs/Documents/financial-services/me_Islamic-finance_corporate-sukuk-in-europe.pdf)
- Dimson, E., Marsh, P. and Staunton, M., 2009. *Triumph of the optimists: 101 years of global investment returns*. Princeton University Press.
- Deniz Basar, O. & Genc, E. (2019). Comparison of Country Ratings of Credit Rating Agencies with MOORA Method. Business and Economics Research Journal. 10. 391-404. 10.20409/berj.2019.175.
- Fabozzi, F. (2006). The Handbook of Fixed Income Securities. 7th ed. McGraw-Hill Publishing.
- ICMA , (2018) Green Bond Principles. Available at: <https://www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/>
- ICMA, (2019). Assessment of Market Practice and Regulatory Policy, Quarterly Report 4th Qtr, Issue 55. Available at: <https://www.icmagroup.org/Regulatory-Policy-and-Market-Practice/Regulatory-Policy-Newsletter/Previous-versions/>
- McIntosh, R. and Murik, V.A. (2012). The role of fixed income as part of a diversified investment strategy. Available at: <https://static.vgcontent.info/crp/intl/auw/docs/literature/The-role-of-fixed-income-whitepaper.pdf?20190930%7C173924>
- Mishkin, F. (2015). The Economics of Money, Banking and Financial Markets 4th ed. Canada
- Mishkin, F. and Eakins, S. (2015). Financial markets and institutions. 8th ed. Boston: Pearson.
- Visser, H. (2009). Islamic Finance: Principles and Practice, Gloucester: Edward Elgar Publishing.
- Westerhout, E. and Ciocyte, O. (2017). The role of inflation-linked bonds. CPB Discussion Paper 344.

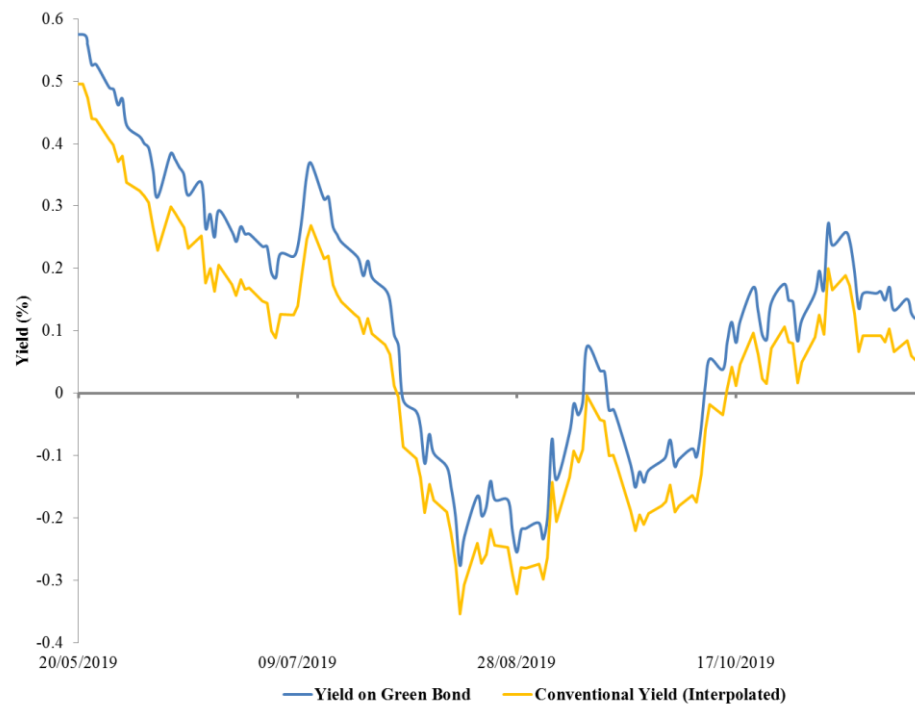
## Appendix

**Chart A.1 France Green versus Conventional Yield Comparison**



*Source: Bloomberg*

**Chart A.2: The Netherlands Green versus Conventional Yield Comparison**



*Source: Bloomberg*