The concepts of yield

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Abstract

In this paper, I describe the concepts of yield.
The paper ends with "The End"

Introduction

Many individuals wonder about yield as there is no standard worldwide definition of yield.

In order to remedy this situation, in this paper, I describe the concepts of yield.

The definition of an asset

An **asset** is any good with cash-flow(s) or any service with cash-flow(s) that **regulation** in the economy **doesn't prevent** an investor from **holding**.

Examples of assets include a farm, a gold mine, stocks of a company, commercial paper and even government bonds or corporate bonds.

The definition of yield

Yield is the return an investor in an asset receives from **holding** that asset from $t = \tau$ (**the time of investment**) to $t = T > \tau$ (**the time of maturity**).

The nominal problem of a negative yield

Note that the definition of yield doesn't **exclude** the yield from being **negative**, which is sometimes not only **the market value** but also **the negotiated value**.

Therefore, **the nominal problem of a negative yield** is that it **ultimately appears as a loss** on the balance sheet of an organization.

The solution to the nominal problem of a negative yield

The solution to the nominal problem is simple: the organization either **recognizes the loss** on the **regular** financial statement(s) of the organization or **sells the asset** on either the secondary market or perhaps through intermediary organizations but **ultimately** to a central bank.

If monetary policy in the economy is conducted by a **credible** central bank and fiscal policy in the economy is conducted by a **credible** government, the losses on the balance sheet of the central bank from negative yields are theoretically not a problem, since the central bank **can** and **should** hold a **reserve of losses** as well as a **reserve of profitable assets** to **prevent speculative runs** on the central bank.

The real problem of a negative yield

When the yield is negative, **monetary transmission** via a **credible** central bank's monetary policy transmits risk to holders of assets.

If the holders of assets are **heterogeneous** and **hold well-diversified portfolios**, monetary transmission **increases risk** in their portfolios and **increases the probability** of a **positive return**.

But if the holders of assets are **homogeneous** and/or **hold under-diversified portfolios**, monetary transmission not only **increases risk** in their portfolios but also **increases the probability** of a **negative return** .

Most investors are **risk-averse** and yet **tolerant of risk in anticipation of a positive return**. Thus the **real problem of a negative yield** manifests as both a **psychological barrier** as well as **more risk**.

Yield to maturity of a no-coupon bond

The **yield to maturity** of a **no-coupon bond** paying face value $F \neq 0$ at $t = T$ and priced $P \neq 0$ at $t = \tau < T$ is

$$y = \frac{\frac{F}{P} - 1}{T - \tau}$$

Yield of an asset with yearly cash-flows

The **yield of an asset with yearly cash-flows** is the interest rate that makes the **present value** of the cash-flows from that asset **equal** to the **price** of that asset, i.e.,

$$P_0 = C_0 + \sum_{t=1}^{n} \frac{C_t}{(1+y)^t}$$

where
P_0 is the market price of the asset at year 0
C_t is the cashflow in year t
n is the number of years the asset is held
y is the yield on an asset with yearly cash-flows

Yields of all remaining assets

Yields of all remaining assets **vary** because the **frequencies** of cash-flows of those assets are **different** from **both** no-coupon bonds and an asset with yearly cash-flows.

Thus, for all remaining assets, the two formulae above don't hold, and various **methods** or **models** or **methodologies** are required to price all remaining assets **correctly** and **efficiently** as the collection of investable assets grows larger.

For a reader interested in these methods, models and methodologies, a list of references is supplied before the end of this paper.

The decomposition of any yield

The **decomposition** of any yield is

$$y = y_r + (y_n - y_r) - y_c$$

where
y is the yield
y_r is the **real yield**
y_n is the **nominal yield**
$(y_n - y_r)$ is the **actual yield**
y_c is the **convenience yield**

References

1. Reitano - Foundations of Quantitative Finance
2. Cochrane - Asset Pricing
3. Fabozzi - Encyclopedia of Financial Models

The End