

## *Yield-to-Maturity and the Reinvestment of Coupon Payments: Reply*

*Shawn M. Forbes, John J. Hatem and Chris Paul<sup>1</sup>*

### **ABSTRACT**

Our original note addressed a common misconception that to earn the yield-to-maturity (YTM) on a coupon bond an investor must reinvest the coupon payments. Shirvani and Wilbratte (2009) take issue with our presentation and results. We will demonstrate that their arguments entirely rest on the proposition that the YTM must equal the realized compounded yield (RCY). This is a construct that explicitly assumes coupon reinvestment. We made no claim in our original presentation with regard to their proposition, because it is not required to calculate the YTM. Furthermore, we will discuss their claims with regard to the “economic significance” of the yield to maturity measure.

### **Introduction**

In a recent issue of this journal (Forbes, Hatem and Paul, 2008), we presented a simple demonstration that yield-to-maturity is a discount rate and that its calculation requires no assumption of coupon payment reinvestment. Our purpose was to correct a recurring error found in many contemporary investment texts in spite of Renshaw (1957) addressing the misconception for capital budgeting decisions over 50 years ago. In their comment Shirvani and Wilbratte (2009) provide two additional examples (Fabozzi and Modiglianai, 2002; and Mayo, 2008) of the coupon-reinvestment assumption. Their comment makes several arguments against our demonstration and additional claims concerning the usefulness of YTM; as will be shown below none of their arguments or claims are relevant to our original point.

### **Yield-to-Maturity is a Discount Rate**

The standard definition of YTM describes the method of calculation. It states that, “The yield to maturity is the single discount rate that, when applied to all future interest and principal payments, produces a present value equal to the purchase price of the security.” Note that the definition explicitly states that YTM is a **discount rate** and is used to equate future cash flows with the bond price or **present value**. No assumption or condition for the reinvestment of coupon payments is made or required. The calculation of YTM is definitional and neither controversial nor ambiguous. If all promised payments are received the bond purchaser will earn the YTM.

### **Yield-to-Maturity is Not a Compound Rate**

By rearranging the present value equation into their equation (2), a calculation of future value, Shirvani and Wilbratte (2009) analysis imposes additional requirements unrelated to, and unnecessary for, the calculation of the YTM. They state that the equation is an “alternative but equivalent form.” However, the forms are not equivalent from a financial perspective. Specially, the future value form imposes the additional requirement that the YTM must equal the RCY and the calculation of RCY requires coupon reinvestment. By imposing these additional conditions they are no longer discussing YTM as correctly defined and calculated. Consequently their conclusion that, “the promised yield to maturity of a coupon bond ... cannot be meaningfully separated from the rates at which the bond coupons are reinvested,” is simply incorrect. Their additional claim that, “while the promised yield to maturity of a coupon bond is

---

<sup>1</sup> Shawn M. Forbes, Professor of Finance, Department of Accounting and Finance, Wofford College, Spartanburg, South Carolina 29303-3663, John J. Hatem, Associate Professor of Finance, and Chris Paul, Professor of Finance, Department of Finance and Quantitative Analysis, Georgia Southern University, Statesboro, Georgia 30460-0001

generally unrealizable if the bond is held to maturity, it is attained if the bond is held to duration,” is based on the reinvestment of coupon and the sensitivity of bond prices to changes in interest rates, both of which are unrelated to the calculation of YTM.

A bond is a debt instrument and has the same characteristics as an interest-only mortgage with a principal balloon payment. The coupon and the mortgage interest payments are calculated in the same manner. However, nowhere in the literature is it claimed that the mortgagor must reinvest the interest payments at the original mortgage rate until the principal is repaid at the time of maturity to earn the calculated mortgage rate.

### **The Economic Importance of Discount Rates**

In addition to their technical arguments the authors also claim that because the YTM will seldom equal the RCY; it a “fictitious mathematical construct,” and “is devoid of much economic significance.” Rather than being fictitious the YTM specifies the relationship between a transaction price and the timing and magnitude of future real cash flows. Discount rates are used in all types of financial instruments with both lenders and borrowers relying on them for specifying loan terms. That is, the present value or loan amount and the timing and magnitude of payments. Additionally, these discount or interest rates for various types of credit are necessary for the efficient allocation of scarce financial capital in both the firm and economy. This is a function that the backward-looking RCY cannot perform. Thus, we argue that discount rates are both real and of economic significance.

### **Conclusion**

We reaffirmed that the calculation of the yield-to-maturity does not require the coupon payment reinvestment assumption, and that the yield-to-maturity will be earned if all payments are made as promised. The critique offered by Shirvani and Wilbratte was shown to rest upon the equivalency the present value and future value calculations. While mathematically equivalent, the two equations are not financially equivalent, as the future value calculation imposes the additional conditions of coupon reinvestment and equality of the discount and compound rate. Thus, their conclusions are irrelevant to the correct calculation of YTM.

As the calculated discount rate of future cash flows the YTM is no different than other calculated discount rates used in every type of loan agreement. As such, the YTM and other calculated rates are indispensable in the operation of credit markets. Backward-looking compound rates cannot perform this function.

## References

Fabozzi, Frank J. and Franco Modigliani, *Capital Markets – Institution and Instruments*, 3<sup>rd</sup> Edition, Prentice Hall.

Forbes, Shawn M., John J. Hatem, and Chris Paul. “Yield-to-Maturity and the Reinvestment of Coupon Payments.” *Journal of Finance and Economics Education*, Volume 7, Number 1, Summer, 48-51.

Johnston, Ken, Shawn Forbes, and John Hatem, 2002. “Reinvestment Rate Assumptions in Capital Budgeting: A Note,” *Journal of Economics and Finance Education*, Volume 1, Number 2, Winter, 28-29.

Mayo, Herbert, 2008, *Investment: an Introduction*, 9<sup>th</sup> Edition, United States.

Renshaw, Ed. 1957. “A Note on the Arithmetic of Capital Budgeting Decisions,” *Journal of Business*, Volume 30, Number 3, July, 193-201.

Shirvani, Hassan and Bary Wilbratte, “The Relationship between the Promised and Realized Yield to Maturities Revisited.” In this issue.