**Topic: Approximate Dollar-Weighted Yield**

Brenna invests money in the Mills Fund for two years. She wants to approximate her annual dollar weighted return over those two years.

Brenna initially invests 10,000 into the Fund. At the end of 5 months, Brenna has 12,000 and withdraws 4800 to buy a used car. At the end of 17 months, Brenna has 7500 and invests another 3600 in the Fund. After 24 months, Brenna has 12,000.

Estimate Brenna's annual dollar weighted rate using the simple interest method that we learned in class.

**Solution:**

$$A+C+I=B \Longrightarrow 10,000+(-4800+3600)+I=12,000$$

$$I=3200$$

$$j=\frac{3200}{10,000-4800\left(1-\frac{5}{24}\right)+3600\left(1-\frac{17}{24}\right)}=0.44137931$$

$$1+i=(1+j)^{1/T}=(1.44137931)^{1/2}=1.2006 \Longrightarrow Answer=0.2006$$

Emma had 30,000 in her investment account on January 1, 2017.

On August 1, 2017, Emma's account had a value of 32,000 and she withdrew 15,000 to pay her tuition.

On January 1, 2018, her account had a value of 18,000. On this date, Emma took all her Christmas gifts and deposited 12,000 into her account.

On December 31, 2018, Emma's account was worth 33,000.

Estimate Emma's annual dollar weighted return using simple interest.

**Solution:**

$$A+C+I=B \Longrightarrow 30,000-15,000+12,000+I=33,000$$

$$I=6000$$

$$j=\frac{I}{A+\sum C_t(1-t)}=\frac{6000}{30,000-15,000(1-7/24)+12,000(1-12/24)}=0.236453201$$

But we need the annual estimated dollar weighted rate which is $i$

$1+i=(1+j)^{1/T}$ where $T$ is the time being analyzed in years.

$$1+i=(1.236453201)^{1//2}=1.111959 \Longrightarrow i=0.11196$$

Tague opens a new bank account with a deposit of 3000 on February 1, 2018. On April 1, 2018, the account is worth 3100 and he deposits another 2000 into the account. On July 1, 2018, he withdraws 3500 to go on vacation. After the withdrawal, Tague had 1700 left in the account. He closes the account on November 30, 2018 by withdrawing 1850.

Estimate, using the simple interest method learned in class, the annual effective dollar weighted return earned by Tague on the bank account.

**Solution:**

You can treat the 3000 deposit at time 0 as the amount at time 0 or as a contribution at time 0. Additionally, you can treat the 1850 at the end as the ending balance or as a negative contribution at that time. We will treat them as balances but if you treat them as contributions, you will get the same answer.

$$A = 3000; B = 1850; C = 2000 - 3500 = -1500$$

$$A + C + I = B \Longrightarrow 3000 - 1500 + I = 1850 \Longrightarrow I = 1850 - 3000 + 1500 = 350$$

$$j = \frac{350}{3000 + 2000(1 - 2/10) - 3500(1 - 5/10)} = 0.12281$$

$$1 + i = (1 + j)^{\frac{1}{T}} = (1.12281)^{\frac{1}{10/12}} = (1.12281)^{12/10} = 1.149122 \Longrightarrow i = 0.149122$$

Ally invests money in the Ginuli Fund for two years. She wants to approximate her annual dollar weighted return over those two years.

Ally initially invests 5,000 into the Fund. At the end of 12 months, Ally has 6,000 and deposits 4000. At the end of 19 months, Ally has 10,500 and withdraws 2500. After 24 months, Ally has 9,000.

Estimate Ally's annual dollar weighted rate using the simple interest method that we learned in class.

**Solution:**

$$A = 5,000; B = 9,000; C = 4,000 - 2,500 = 1,500$$

$$A + C + I = B \implies 5,000 + 1,500 + I = 9,000 \implies I = 2,500$$

$$j = \frac{2,500}{5,000 + 4,000\left(1 - \frac{12}{24}\right) - 2,500\left(1 - \frac{19}{24}\right)} = 0.38585$$

$$1 + i = (1 + j)^{\frac{1}{T}} = (1.38585)^{\frac{1}{2}} = 1.17722 \implies i = 0.17722$$

Winnie invests in the Chow Fund. On January 1, 2016, her account has a balance of 75,000 in the Fund. On April 30, 2016 Winnie has a balance of 80,000 and decides to withdraw 20,000 to go to Europe for the summer. On August 30, 2016, Winnie has a balance of 55,000 in the Fund. She decides to deposit 12,000 in the Fund at that time.

Finally, on August 1, 2017, Winnie withdraws 15,000 to pay her tuition. Prior to the withdrawal, Winnie had a balance of 72,000.

On December 31, 2017, Winnie has a balance of 60,000.

Estimate Winnie's annual dollar weighted return using the simple interest estimate that we learned.

**Solution:**

$$A + C + I = B \Longrightarrow 75,000 + (-20,000 + 12,000 - 15,000) + I = 60,000$$

$$I = 8000$$

$$j = \frac{8000}{75,000 - 20,000\left(1 - \frac{4}{24}\right) + 12,000\left(1 - \frac{8}{24}\right) - 15,000\left(1 - \frac{19}{24}\right)} = 0.1265656$$

$$1 + i = (1 + j)^{1/T} = (1.1265656)^{1/2} = 1.061398 \Longrightarrow Answer = 0.061398$$