<table>
<thead>
<tr>
<th>#</th>
<th>TVM Formula For:</th>
<th>Annual Compounding</th>
<th>Compounded/Payments (m) Times per Year</th>
<th>Continuous Compounding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Future Value of a Lump Sum. (PVIF(i,n))</td>
<td>(FV_n = PV(1+i)^n)</td>
<td>(FV_n = PV\left(1+i/m\right)^{m\cdot n})</td>
<td>(FV_n = PV\left(e\right)^{i\cdot n})</td>
</tr>
</tbody>
</table>
| 2  | Present Value of a Lump Sum. (PVIF\(i,n\)) | \(PV = \frac{FV}{(1+i)^n}\)  
or  
\(PV = FV(1+i)^{-n}\) | \(PV = \frac{FV}{\left(1+i/m\right)^{m\cdot n}}\)  
or  
\(PV = FV\left(1+i/m\right)^{-\left(m\cdot n\right)}\) | \(PV = \frac{FV}{\left(e\right)^{i\cdot n}}\)  
and  
\(PV = FV\left(e\right)^{-i\cdot n}\) |
| 3  | Future Value of an Annuity. (PVIFA\(i,n\)) | \(FVA_n = \frac{\left(1+i\right)^n - 1}{i}\)  
\(FVA_n = CF\left(\left(1+i\right)^\frac{1}{m}\right)^{m\cdot n} - 1\) | \(FVA_n = CF\left(\frac{1+i}{m}\right)^{m\cdot n} - 1\) | \(FVA_n = CF\left(\frac{1+i}{m}\right)^{-i\cdot n} - 1\) |
| 4  | Present Value of an Annuity. (PVIFA\(i,n\)) | \(PV_{An} = \frac{1 - \left(1+i\right)^{-n}}{i}\)  
\(PV_{An} = CF\left(\frac{1-i}{m}\right)^{m\cdot n} - 1\) | \(PV_{An} = CF\left(\frac{1-i}{m}\right)^{-i\cdot n} - 1\) | \(PV_{An} = CF\left(\frac{1-i}{m}\right)^{-i\cdot n} - 1\) |
| 5  | Present Value of Perpetuity. (PVA\(i\)) | \(PVA_n = \frac{CF}{i}\)  
\(PVA_n = \frac{CF}{(1+i)^\frac{1}{m}\cdot n}\) | \(PVA_n = \frac{CF}{\left(1+i\right)^{\frac{1}{m}}\cdot n}\) | \(PVA_n = \frac{CF}{\left(1+i\right)^{\frac{1}{m}}\cdot n}\) |
| 6  | Effective Annual Rate given the APR. | \(EAR = APR = \frac{i}{m}\)  
\(EAR = \left(1+i\right)^\frac{1}{n} - 1\) | \(EAR = \left(1+i\right)^\frac{1}{n} - 1\) | \(EAR = e^i - 1\) |
| 7  | The length of time required for a PV to grow to a FV. | \(n = \frac{\ln(FV/PV)}{\ln(1+i)}\) | \(n = \frac{\ln(FV/PV)}{m \times \ln(1+i/m)}\) | \(n = \frac{\ln(FV/PV)}{i}\) |
| 8  | The APR required for a PV to grow to a FV. | \(i = \left(\frac{FV}{PV}\right)^\frac{1}{n} - 1\) | \(i = m \times \left[\left(\frac{FV}{PV}\right)^\frac{1}{m \cdot n}\right] - 1\) | \(i = \frac{\ln(FV/PV)}{n}\) |
| 9  | Present Value of a Growing Annuity. | \(PV_{An} = \frac{CF\left(1+g\right)}{i-g}\left[1-\left(\frac{1+g}{1+i}\right)^n\right]\) | \(PV_{An} = \frac{CF\left(1+g\right)}{i-g}\left[1-\left(\frac{1+g}{1+i}\right)^n\right]\) | \(PV_{An} = \frac{CF\left(1+g\right)}{i-g}\left[1-\left(\frac{1+g}{1+i}\right)^n\right]\) |
| 10 | Present Value of a Growing Perpetuity. | \(PVA_{\infty} = \frac{CF\left(1+g\right)}{i-g}\) | \(PVA_{\infty} = \frac{CF\left(1+g\right)}{i-g}\) | \(PVA_{\infty} = \frac{CF\left(1+g\right)}{i-g}\) |
| 11 | The length of time required for a series of PMTs to grow to a future amount (FVA\(_n\)). | \(n = \frac{\ln\left[\frac{(FVA)(i)}{CF} + 1\right]}{\ln(1+i)}\) | \(n = \frac{\ln\left[\frac{(i/m)(FVA + m)}{CF\left(1/m\right)}\right]}{m \times \ln(1+i/m)}\) | \(n = \frac{\ln\left[\frac{(i/m)(FVA + m)}{CF\left(1/m\right)}\right]}{m \times \ln(1+i/m)}\) |
| 12 | The length of time required for a series of PMTs to exhaust a specific present amount (PVA\(_n\)). | \(n = \frac{\ln\left[1-\frac{(PVA)(i)}{CF}\right]}{\ln(1+i)}\), \(for\ PVA(i) < CF\) | \(n = \frac{\ln\left[1-\frac{(PVA)(i/m)}{CF}\right]}{m \times \ln(1+i/m)}\), \(for\ PVA(i/m) < CF\) | \(n = \frac{\ln\left[1-\frac{(PVA)(i/m)}{CF}\right]}{m \times \ln(1+i/m)}\), \(for\ PVA(i/m) < CF\) |

**Legend**

- \(i = APR\), the nominal or Annual Percentage Rate  
- \(n = \) the number of periods  
- \(m = \) the number of compounding periods per year  
- \(EAR = \) the Effective Annual Rate  
- \(\ln = \) the natural logarithm, the logarithm to the base \(e\)  
- \(e = \) the base of the natural logarithm \(\approx 2.71828\)  
- \(CF = PMT = \) the periodic payment or cash flow  
- \(\text{Perpetuity} = \) an infinite annuity  

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