**The Nominal Rate**

- Interest stated in money.
- I lend you 100 pictures of George; you promise to give me 106 back.

\[ r_N = 6\% \]

**The Real Rate**

- Interest stated in purchasing power.
- I lend you enough to purchase 100 slices of pizza; you promise to repay me enough to purchase 103.

\[ r_R = 3\% \]

**The Relation**

- I have promised you a real return of \( r_R \)
- The inflation rate is \( \eta \)
- What kind of nominal return \( r_N \) have I promised?

\[ \$100(1 + r_R) \]

**Amount due with no inflation**

\[ \$100(1 + r_R)(1 + \eta) \]

**Inflation adjustment**
The Relation

\[ \frac{100(1+r_R)}{1+\eta} = \frac{100(1+r_N)}{1+\eta} \]

Amount due in nominal terms

The Relation

\[ (1+r_R)(1+\eta) = (1+r_N) \]

The Fisher Equation

\[ (1+r_N) = (1+r_R)(1+\eta) \]

\[ r_N = r_R + \eta + r_R\eta \]

\[ r_N \approx r_R + \eta \]

An Aside

\[ r_N = r_R + \eta + r_R\eta \]

\[ r_N \approx r_R + \eta \]

How good is the approximation

\[ r_R = 3\% \]

\[ \eta = 2\% \]
How good is the approximation

\[ r_R = 3\% \]
\[ \eta = 2\% \]
\[ r_N = r_R + \eta + r_R\eta \]
\[ = 0.0506 \]
\[ r_N \approx r_R + \eta = 0.05 \]
More on the Basics of the Demand for Money

How good is the approximation

\[ r_R = 3\% \]  
\[ \eta = 2\% \]  
\[ r_N = r_R + \eta + r_R\eta = 0.0506 \]  
\[ r_N \cong r_R + \eta = 0.05 \]  
\[ r_R = 50\% \]  
\[ \eta = 50\% \]  
\[ r_N = r_R + r_R\eta = 1.25 \]  
\[ r_N \cong r_R + \eta = 1.00 \]

5% versus 5.06%. Not bad

End of Aside

Prices Double Every Year

<table>
<thead>
<tr>
<th>Daily Balances</th>
<th>0 Trips</th>
<th>One Trip</th>
<th>Two Trips</th>
<th>Five Trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>$80</td>
<td>$140</td>
<td>$160</td>
<td>$180</td>
</tr>
<tr>
<td>Tuesday</td>
<td>$80</td>
<td>$140</td>
<td>$160</td>
<td>$160</td>
</tr>
<tr>
<td>Wednesday</td>
<td>$80</td>
<td>$140</td>
<td>$120</td>
<td>$140</td>
</tr>
<tr>
<td>Thursday</td>
<td>$80</td>
<td>$80</td>
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</tr>
<tr>
<td>Friday</td>
<td>$80</td>
<td>$80</td>
<td>$80</td>
<td>$80</td>
</tr>
<tr>
<td>Saturday</td>
<td>$80</td>
<td>$80</td>
<td>$80</td>
<td>$80</td>
</tr>
</tbody>
</table>

Interest (0.0015 x Daily Balances)  
- Monday: $0.720  
- Tuesday: $0.990  
- Wednesday: $1.080  
- Thursday: $1.170  
- Friday: $0.120  
- Saturday: $0.120

Trip Cost  
- Monday: $0.120  
- Tuesday: $0.240  
- Wednesday: $0.600

Net Earnings  
- Monday: $0.720  
- Tuesday: $0.870  
- Wednesday: $0.840  
- Thursday: $0.570

Which rate should we use here? The real or the nominal?

r_N, the nominal rate, for money is a nominal asset. The interest we lose by being in money is a nominal rate.
Wealth calculations and the like can be done either in real rates if we discount real (inflation adjusted) cash flows or in nominal rates if we discount nominal cash flows.

### Properties of Money Demand Function

- Demand for *nominal* money balances rises in proportion to prices.
- Demand for *real* money balances rises with income.
- Demand for money balances is a function of the *nominal* interest rate.

Intuitively, money is subject to “depreciation”, that is the loss of value as a function of inflation, and including a term for inflation captures this effect.