1. Yishen wants to buy 100 ounces of gold at the end of one year. She also wants to buy 250 ounces of gold at the end of two years. Finally, she wants to buy 400 ounces of gold at the end of three years.

You are given the following spot interest rates and forward gold prices:

<table>
<thead>
<tr>
<th>Time t</th>
<th>Spot rate r&lt;sub&gt;t&lt;/sub&gt;</th>
<th>Forward Gold Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>4.0%</td>
<td>1225</td>
</tr>
<tr>
<td>1.0</td>
<td>4.3%</td>
<td>1250</td>
</tr>
<tr>
<td>1.5</td>
<td>4.7%</td>
<td>1275</td>
</tr>
<tr>
<td>2.0</td>
<td>5.2%</td>
<td>1300</td>
</tr>
<tr>
<td>2.5</td>
<td>5.8%</td>
<td>1330</td>
</tr>
<tr>
<td>3.0</td>
<td>6.5%</td>
<td>1360</td>
</tr>
</tbody>
</table>

Yishen enters into a three year Swap contract to fix the price of gold.

Calculate the Swap Rate on Yishen’s Swap.

2. (F11PR) You are given the following table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Zero Coupon Bond Price</th>
<th>Oil Forward Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.960</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>0.915</td>
<td>99</td>
</tr>
<tr>
<td>3</td>
<td>0.865</td>
<td>95</td>
</tr>
<tr>
<td>4</td>
<td>0.810</td>
<td>91</td>
</tr>
<tr>
<td>5</td>
<td>0.755</td>
<td>85</td>
</tr>
</tbody>
</table>

Julie will buy 1 million barrels of oil at the end of each year for the next three years.

Calculate the three year swap price.

3. (F11PR) You are given:

<table>
<thead>
<tr>
<th>Year</th>
<th>Oil Forward Price</th>
<th>Zero Coupon Bond Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>132</td>
<td>0.90</td>
</tr>
<tr>
<td>2</td>
<td>140</td>
<td>Z</td>
</tr>
</tbody>
</table>

The price of 2 year oil swap which provides 2000 barrels of oil at the end of one year and 5000 barrels of oil at the end of two years is 137.60.

Calculate Z.
4. (F11PR) You are given the following table.

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero Coupon Bond Price</td>
<td>0.960</td>
<td>0.915</td>
<td>0.865</td>
<td>0.810</td>
<td>0.755</td>
</tr>
<tr>
<td>Oil Forward Price</td>
<td>100</td>
<td>99</td>
<td>95</td>
<td>91</td>
<td>85</td>
</tr>
</tbody>
</table>

Kyle will buy 1 million barrels of oil at the end of year 2 and X million barrels of oil at the end of four years. Kyle enters into a swap in order to fix the price of the oil. The swap price is 93.635.

Calculate X.

5. Smith LTD borrows 1,000,000 for the next three years. The interest rate on the loan is variable and will be the one year interest rate each year. Smith purchases a three year interest rate Swap to fix the interest rate.

You are given the following spot interest rates:

<table>
<thead>
<tr>
<th>Time t</th>
<th>Spot rate $r_t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>4.0%</td>
</tr>
<tr>
<td>1.0</td>
<td>4.3%</td>
</tr>
<tr>
<td>1.5</td>
<td>4.7%</td>
</tr>
<tr>
<td>2.0</td>
<td>5.2%</td>
</tr>
<tr>
<td>2.5</td>
<td>5.8%</td>
</tr>
<tr>
<td>3.0</td>
<td>6.5%</td>
</tr>
</tbody>
</table>

Determine the fixed interest rate the Smith will pay under the Swap.

6. (F11PR) You are given the following table.

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero Coupon Bond Price</td>
<td>0.960</td>
<td>0.915</td>
<td>0.865</td>
<td>0.810</td>
<td>0.755</td>
</tr>
<tr>
<td>Oil Forward Price</td>
<td>100</td>
<td>99</td>
<td>95</td>
<td>91</td>
<td>85</td>
</tr>
</tbody>
</table>

Katie has a line of credit on which she pays the interest at the one year spot rate. Katie will need to have a loan of 50,000 during the next year and 100,000 during the second year.

Katie enters into a swap in which she swaps her floating rate on her debt over the next two years for a fixed interest rate.

Calculate the fixed interest rate on Katie’s swap.
7. (F11PR) You are given the following spot yield curve:

<table>
<thead>
<tr>
<th>Time</th>
<th>Spot Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.00%</td>
</tr>
<tr>
<td>2</td>
<td>5.00%</td>
</tr>
<tr>
<td>3</td>
<td>5.75%</td>
</tr>
<tr>
<td>4</td>
<td>6.25%</td>
</tr>
<tr>
<td>5</td>
<td>6.50%</td>
</tr>
</tbody>
</table>

Jacque has a variable rate loan for 5000 for the next 2 years where the interest rate is reset annually. Jacque purchases an interest rate swap to fix the interest rate. Determine the fixed interest rate.

8. Cunningham Airlines entered into a Swap contract for jet fuel one year ago. As of today, under the Swap contract, Cunningham will purchase 100,000 gallons of jet fuel at the end of six months and 200,000 gallons of jet fuel at the end of two years. The Swap Rate will be 3.00 per gallon of jet fuel.

You are given the following spot interest rates and forward prices on jet fuel as of today:

<table>
<thead>
<tr>
<th>Time t</th>
<th>Spot rate $r_t$</th>
<th>Forward Prices on Jet Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>4.0%</td>
<td>2.90</td>
</tr>
<tr>
<td>1.0</td>
<td>4.3%</td>
<td>3.05</td>
</tr>
<tr>
<td>1.5</td>
<td>4.7%</td>
<td>3.15</td>
</tr>
<tr>
<td>2.0</td>
<td>5.2%</td>
<td>3.25</td>
</tr>
<tr>
<td>2.5</td>
<td>5.8%</td>
<td>3.30</td>
</tr>
<tr>
<td>3.0</td>
<td>6.5%</td>
<td>3.32</td>
</tr>
</tbody>
</table>

Calculate the market value of the Swap today.
9. (F11PR) You are given the following table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Zero Coupon Bond Price</th>
<th>Oil Forward Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.960</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>0.915</td>
<td>99</td>
</tr>
<tr>
<td>3</td>
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</tr>
<tr>
<td>4</td>
<td>0.810</td>
<td>91</td>
</tr>
<tr>
<td>5</td>
<td>0.755</td>
<td>85</td>
</tr>
</tbody>
</table>

Heather enters into a two year oil swap with a swap of 1 million barrels of oil being swapped at the end of each year.

Immediately after Heather enters the swap, the forward price of oil in one year increases to 104 while the forward price of oil in two years increases 103.

Calculate the market value of the swap.

10. (S09T4) Bob’s Bakery specializes in corn bread muffins. One year ago Bob entered into a three year swap. There are two years remaining on the swap which allows Bob to purchase 100 bushels of corn one year from now and another 100 bushels of corn two years from now for a fixed price of 3.50 per bushel. The following table lists the current spot interest rates and forward price of corn:

<table>
<thead>
<tr>
<th>Time</th>
<th>Spot Interest Rate</th>
<th>Forward Price of a Bushel of Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Year</td>
<td>0.05</td>
<td>4.00</td>
</tr>
<tr>
<td>2 Years</td>
<td>0.06</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Calculate the market price of the swap.

11. (S10T4) Emily owns a swap. The swap allows Emily to borrow 100,000 during the next two years at an interest rate of 5%. The following table lists the current spot interest rates:

<table>
<thead>
<tr>
<th>Time</th>
<th>Spot Interest Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Year</td>
<td>0.05</td>
</tr>
<tr>
<td>2 Years</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Determine market value of this swap if Emily sold it today.
Answers

1. 1323.09
2. 98.09
3. 0.84
4. 2.3
5. 6.399%
6. 4.66%
7. 4.975%
8. 35,373.39
9. 7.5 million
10. 181.12
11. 1788.47