1. Two types of investment

a) Effect of fall in consumer confidence
First note that introducing two types of investment doesn’t change the qualitative properties of our model, and we can use the same graphs as in the model with only one type of investment. To see this, let’s derive what determines total investment, I, in this extended model:

\[ I = I^1 + I^2 \\
= I^1(r^b_1) + I^2(r^b_2) \\
= I^1(r^s + d^1(Y)) + I^2(r^s + d^2(Y)) \\
= I(r^s, Y) \]

Since both types of investment are decreasing in the respective borrowing interest rates and the spread functions are decreasing in output, total investment demand is a decreasing function of \( r^s \) and an increasing function of \( Y \) – just like in the one-differential case. This implies that all of our previous results about the derivation of the IS curve remain unchanged.

(i) A fall in consumer confidence will shift the IS curve to the left, which can be derived from the Keynesian cross diagram in the usual way (not shown): A fall in consumer confidence means lower consumption, hence lower planned expenditure for any level of output, \( Y \). For a given \( r^s \), this shows up as a downward shift of the planned expenditure curve. We conclude that for any level of the savings interest rate, \( r^s \), the goods market clears at a lower level of output, \( Y \). In the IS-MP diagram, this is depicted as the shift from IS\(_1\) to IS\(_2\).
The fall in consumer confidence lowers output from $Y_1$ to $Y_2$. The central bank reacts by reducing the savings interest rate from $r^s_1$ to $r^s_2$. The two differentials, $r^{b1}-r^s$ and $r^{b2}-r^s$, both increase, because the differentials are decreasing in output by assumption.

(ii) According to our assumption, when $Y$ falls, $r^{b2}-r^s$ rises by more than $r^{b1}-r^s$ does, because Type 2 investment is riskier. This implies that the change in $r^{b1}-r^s$ is smaller than the change in $r^{b2}-r^s$.

b) Usefulness of two differentials

Having two differentials would be helpful to analyze a situation when some shock affects various investment types differently. For example, let $I^1$ be residential investment and let $I^2$ be nonresidential (business) investment. Suppose the government decides to promote home ownership by providing direct interest subsidies on mortgages or by guaranteeing the debts of agencies that buy securitized mortgages (like Fannie and Freddie). The result would be that the differential on mortgage loans, $r^{b1}-r^s$, decreases for any level of $Y$. At the same time, this policy change would leave the differential on other loans, $r^{b2}-r^s$, unchanged at a given $Y$. We could use this two-differential model, for example, to explain a boom in residential investment while we don’t see much change in nonresidential investment.

One example where it is unnecessary to have two differentials is if we want to analyze the aggregate effects of financial market turbulence on the real economy. As we showed in part (a), the two-differential model has the same aggregate implications as the one-differential model, so we can just assume one representative type of investment. The shock would then be captured as an increase in the interest rate differential for that representative borrowing interest rate.

2. Balance sheet effects

a) Evidence

Consumers:
- From the history of the Great Depression, we can refer to the effect of installment debt on consumption. Installment debt became popular in the 1920s, but the default laws were extremely harsh. Using time series evidence, Olney (1999) argues that consumers cut back purchases of nondurable goods substantially in 1930, because they wanted to avoid defaulting on their installment debt. Indeed, default rates on car loans were very low, especially when we compare to those in the 1937-38 recession when default laws had already been relaxed.
- In the recent recession, a series of papers by Atif Mian and Amir Sufi demonstrated that highly indebted counties experienced larger declines in consumption, bigger increases in unemployment and slower recoveries than counties with low indebtedness.

Firms:
- For firms, we have somewhat weaker empirical evidence. Koo (2009) argues that the root cause of Japan’s economic woes is the insufficient demand of its indebted corporate sector. He says that the collapse of the stock market and housing bubble impaired Japanese firms’ balance sheets, and since then these firms have engaged in debt minimization instead of profit maximization. This means that they are more focused on repaying debt than identifying good investment opportunities. Koo presents evidence that there is low credit demand (lack of corporate bond issuance, lack of entry of foreign banks, and low interest rates.) However, he presents very little direct empirical evidence about $I$ being unresponsive to $r$. 
b) Deleveraging in the IS-MP diagram
Consumption and investment are components of planned expenditure, so the IS curve is affected. We can imagine two types of changes. First, for any level of disposable income we expect lower consumption and for any level of the interest rate we expect lower investment, since repaying debt takes priority over current spending. This shifts the IS curve leftwards. Second, and potentially more importantly, the responsiveness of consumption to disposable income (MPC) and the responsiveness of investment to the interest rate may become much smaller. These developments make the IS curve steeper. The combined effect of these two changes is shown in Panel A below.

The change of the slope of the IS curve is very important, because it can render monetary policy rather ineffective in fighting a balance sheet recession. In the extreme case, when investment is perfectly insensitive to changes in the interest rate, the IS curve becomes vertical. (Note that MPC=0 does NOT imply a vertical IS curve, because investment can still react to changes in r.) This case is depicted on Panel B, which illustrates why monetary policy is impotent in this case.

c) Policy actions
As discussed above, traditional monetary policy can be quite ineffective with a very steep IS curve. Fiscal policy is still effective, since it can shift the IS curve to the right. Basically, the government can fill in for the missing demand while the private sector is repairing its balance sheet (reduces leverage). However, this can take a long time.

Since the fundamental problem is debt and high leverage, a managed wealth transfer from lenders to debtors might be a useful approach too. This may involve forced government write-downs of private debts or a government funded debt relief program which bails out debtors. This policy targets the fundamental problem more directly, so it is advocated by some economists – including Mian and Sufi.¹

¹ Here is a quote from Amir Sufi: “We've tried a ridiculous number of things in terms of government policy during this downturn: fiscal stimulus, homebuyer tax rebates, cash for clunkers, etc. Can't we at least give principal forgiveness a chance, even if it is on a very small scale?”(Mike Konczal’s interview with Amir Sufi, December 16, 2011)
3. True/false/uncertain

a) True. Consider a bursting of an asset price bubble and a large and rapid decline in asset prices. This may disrupt financial intermediation directly through its impact on financial intermediaries’ balance sheets and indirectly through each of the three types of contagion.

Consider first how the decline in asset prices itself may cause problems for a financial intermediary. Suppose the intermediary has $1 of capital and has borrowed $9 dollars. It has invested its capital and the borrowed funds in the risky asset, so it holds $10 worth of the risky asset. Now suppose the bubble bursts and the price of the risky asset declines 20 percent. The financial intermediary has only $8 worth of assets, but still owes $9 to its lenders: it is insolvent. In an extreme, but empirically unrealistic, case this mechanism could affect enough financial intermediaries to alone cause a large financial crisis.

More realistically, this mechanism is likely to affect some financial intermediaries and contagion is likely to spread the problem throughout the financial system unless there is a strong policy response. If lenders to financial intermediaries (depositors in the case of traditional banks) do not know if a given financial intermediary is insolvent, they may decide to withdraw their funds. As other lenders see funds being withdrawn, they are likely to also ask for their funds. This is confidence contagion – a bank run. Since financial intermediaries borrow short and lend long, they cannot pay all their lenders at once. Thus the result of the bank run may be widespread failures of financial institutions. Counterparty contagion may occur if bank A becomes insolvent and has borrowed from bank B, which has borrowed from bank C, which has borrowed from bank D, and so on. If A cannot pay back B, the result may be a cascading wave of defaults. Thus the insolvency of one financial intermediary may bring down multiple financial institutions. Finally, the bursting of the asset bubble may lead to coordination or “fire sale” contagion. Suppose that because some of its assets have declined greatly in value, a financial intermediary needs to sell large quantities of other, illiquid assets in order to pay back its lenders. Absent deep, liquid markets the sales of these assets will lower their price. If other financial intermediaries also hold these assets, the value of their assets will decline, putting pressure on them to sell other illiquid assets, and so on.

Note that if the question had been “The bursting of an asset price bubble always leads to a financial crisis” the answer would have been ‘false’. Sometimes asset price bubbles can burst with little effect either on the financial system or on the real economy. An example is the bursting of the dot-com stock market bubble in 2000.

b) Uncertain/False. Reich (2010) makes the argument that high income inequality reduces aggregate demand, because wealthy people tend to save most of their income (i.e. they have low MPC). He identifies this as a major cause of the Great Recession and the subsequent slow recovery. The evidence for this mechanism is not very convincing, though. Empirically, low consumption hasn’t been a big problem in the U.S. in recent decades. In fact, the consumption ratio steadily increased from the 1980s. Theoretically, a shift in aggregate demand should affect output only temporarily. Over time, inflation adjustment should move the economy back to long run equilibrium with output being close to its potential level. However, if something impedes the normal adjustment process of the economy, then high income inequality may contribute to prolonged high unemployment due to a shortfall in aggregate demand. One such factor is the zero lower bound. When monetary policy is constrained by the zero lower bound, a leftward shift of the IS curve reduces output, and conventional monetary policy and inflation adjustment cannot undo it.
4. Iceland and Ireland  
a) It is not obvious which data source one should use for the exchange rate of the króna in these turbulent times. When the banking panic intensified, the Icelandic central bank tried to peg the króna – unsuccessfully. In October 2008, trading in the currency collapsed when the last major Icelandic bank was taken into receivership, and thus all króna trade 'clearing houses' were lost. Subsequently, the government introduced capital controls and quotas on how much foreign currency each Icelandic institution was allowed to buy. These measures created a situation when the exchange rate quoted by the central wasn’t really a market clearing price, and the króna could have been traded at different rates in offshore foreign exchange markets. Here we are going to use the ECB reference exchange rate which is different from the official exchange rate series on the Icelandic central banks’s website, but still less extreme than what some news reports from the crisis period suggest.

Figure 1 plots the ECB reference exchange rate (ISK/EUR) between January 2008 and May 2009 when it is available. We can see the sharp depreciation after September 2008. The low point was 305 ISK/EUR which means a depreciation of 92% (computed as 100 times the change in the natural log of the exchange rate) compared to the average August 2008 exchange rate.2 However, when market conditions normalized, the currency regained most of this initial loss. The króna traded at 152.94 against the euro on April 24, 2013, only 22.5% below its pre-crisis level (Table 1).

Figure 1: ECB reference exchange rate (ISK/EUR)

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2 According to news reports, the króna traded at 340 before trade collapsed, but this doesn’t show up in the ECB reference rate. (Nielson, Bo [9 October 2008]. "Iceland's Krona Currency Trading Halts as Kaupthing Taken Over". Bloomberg.) The highest exchange rate that the Icelandic central bank reports on its website is 187 ISK/EUR.
b) Table 1 shows the differential evolution of unemployment in Iceland and Ireland. The unemployment rate increased much more in Ireland, starting from an already higher level. Moreover, Iceland has regained more than half of the employment loss by now. In contrast, Irish unemployment is only slightly below its peak level.

<table>
<thead>
<tr>
<th></th>
<th>Pre-crisis (August 2008)</th>
<th>Low point</th>
<th>Change</th>
<th>Memo: Value today</th>
</tr>
</thead>
<tbody>
<tr>
<td>Króna/euro</td>
<td>122.07</td>
<td>305 (October 9, 2008)</td>
<td>92%*</td>
<td>152.94 (April 20, 2013)</td>
</tr>
<tr>
<td>Unemployment – Iceland</td>
<td>3.2%</td>
<td>7.9% (November 2010)</td>
<td>4.7 ppt</td>
<td>5.1% (February 2013)</td>
</tr>
<tr>
<td>Unemployment – Ireland</td>
<td>7.0%</td>
<td>15.1% (November 2011)</td>
<td>8.1 ppt</td>
<td>14.2% (February 2013)</td>
</tr>
</tbody>
</table>

*Calculated as the change in natural logarithms.

c) Figure 2 shows net exports as a share of GDP in the two countries before and after the banking crisis. The trade balance improved in both countries, but the improvement is faster and more pronounced in Iceland, which is consistent with the hypothesis that exchange rate depreciation helped cushion the effects of the banking crisis in Iceland.

Figure 3 gives some more details where the improvement in net export is coming from. It shows the evolution of real imports and exports in the two economies. Iceland’s exporters performed better than exporters in Ireland, which suggests that currency depreciation improved the competitiveness of Icelandic producers. At the same time, imports in Iceland fell remarkably, which suggests the depreciation made foreign goods punishingly expensive.³

³ Of course, the fall in imports also reflects the general decline in aggregate demand, since a fraction of consumption, investment and government purchases comes from abroad. However, the improvement of the trade balance (Figure 1) suggests that the proportional decline in imports was much bigger than the decline in GDP. This disproportional decline in imports can be explained by the exchange rate depreciation.
Figure 3: Export and import volume indexes (2005=100, Eurostat, seasonally adjusted)

5. d
6. b
7. c
8. c