Information Asymmetries on Financial Markets*

“All of the books in the world contain no more information than is broadcast as video in a single large American city in a single year – Not all bits have equal value.”
CARL SAGAN

So far we assumed common knowledge about the (state-contingent) pay-offs of assets. Imagine now that some agents know the payoffs better than others. Then – besides intertemporal substitution, risk sharing and betting on the occurrence of the states of the world – a seller of an asset might want to sell it because he knows it has very low pay-offs. Anticipating this no agent would buy at a price allowing the seller to make a profit and ultimately no transaction is made. In the subprime mortgage crisis this aspect of asset markets became overwhelming so that asset markets broke down completely.

This chapter of our book shows how to model asymmetric information. It shows the effects of asymmetric information on market prices, banking and insurance contracts. A formal way allowing these aspects to be integrated into the previous model is to let agents’ beliefs on the occurrence of the states of the world depend on their market observations: prices and transactions. In this sense asymmetric information is not an alternative to what we learned so far but a generalization.

Let us start with an introductory example on the topic of information that illustrates some of the fundamental ideas in a somehow not so serious way (translated from [nzz00]):

In Gelosia, wives are not lenient towards unfaithful husbands. One morning, the queen summoned all women: “Word has reached me that at least one of our husbands has been unfaithful. If one of you discovers that your husband has cheated, you must kill him come midnight on the same day you found out.”

Gelosian women love to gossip, so if one of their husbands was unfaithful, the entire country would know by next morning. Only his wife would be kept in the dark out of respect. For a long time after the queen’s speech, nothing has happened. Suddenly, 39 days later, all 40 women resort to the knife and send their husbands to heaven come in a country-wide massacre.
These horrible events are an example of how insight grows through a series of conclusions. The queen mentioned “at least one” cheater. If there had only been a single one, his wife would immediately have known: since she had not heard of any affair, she had to be the betrayed one.

With two casanovas, there would have been two dead husbands one day after the address. The lack of news of a killing on the first night would have told their wives that they were unfaithful, since there now had to be at least two affairs – otherwise someone would have been killed on the first night already – and they had only heard of a single one. This can be formulated mathematically: no execution at midnight on the $n$-th day means that at least $n + 1$ husbands were unfaithful.

Thus, on the morning of the 40th day, all 40 women knew that at least 40 husbands had to have been unfaithful. Since there were only 40 women, who each had heard of only 39 affairs, they all concluded that their husband had to be the 40th culprit.

### 7.1 Information Revealed by Prices

The idea of the following example is due to Akerlof [Ake70]:\(^1\) If a vendor is too willing to lower prices, potential customers will think the quality of his products is rather low. This might lead to the vendor not being able to sell at all. This phenomenon is referred to as the “market for lemons” where “lemon” is a colloquial term for an inferior quality product. A typical example for this are used cars. We model the effect as follows:

Assume there is a product in two different quality levels, denoted by $H$ (high) and $L$ (low), where $H > L$. Let $\mu$ and $1 - \mu$ be the commonly known proportion of good and bad products, respectively. Let $q$ be the price of the good product. The seller knows the quality $Q$ of his product, where $Q$ can be $H$ or $L$; his utility of the sale is then $V(Q) = q - Q$. If $V(Q) < 0$, he will not make the deal. In particular, no products will be sold at all if the market price $q$ is less than $L$. The buyer on the other hand does not know the quality. However, he has expectations, called beliefs. Let $\beta$ be the buyer’s belief that the product is of high quality $H$. Let the buyer’s utility be the expected quality on the basis of his beliefs minus the price: $U(q, \beta) := \beta H + (1 - \beta)L - q$. Again, the buyer will not go through with the deal if $U(q, \beta)$ is negative.

One easily checks that $\hat{\beta} = 0$ and $\hat{q} = L$ forms an equilibrium in the sense that, given the belief and price, neither buyer nor seller can strictly increase their utility by deviating, i.e., not selling or buying. Only low quality products are traded; there is no market for high quality products. $\hat{\beta} = 0$ and

\(^1\) More information on information revealed by prices is revealed in [GH90].