

CHAPTER 18

EX POST PERFORMANCE MEASURES

In Chapter 17 we assume that the action a and the event θ are not observable, but there is a verified report of the final outcome x . Hence, incentive contracts can be based on the reported outcome. In this chapter we allow for the possibility that the outcome may not be contractible. If it is not, then inducing more than the agent's least cost action will require the use of incentives based on some alternative performance measure that is contractible and is influenced by the agent's action. Furthermore, it is potentially valuable to use more than one performance measure. This chapter explores the relation of the characteristics of alternative performance measures to the principal's expected payoff, and the form of the optimal incentive contract.

We continue to focus on a single-task setting, so that the key benefit from a superior set of performance measures takes the form of a reduction in the risk premium the agent must be paid for taking a given level of induced effort. Of course, a reduction in the risk premium may lead the principal to offer a contract that induces more effort.

Since the outcome x is not necessarily contractible information, it is important to designate whether the principal or the agent is the residual "owner" of that payoff. That "ownership" may derive from legal or physical considerations. For example, the principal may own the production technology and will ultimately receive the final payoff, even though that payoff may not be realized until sometime subsequent to the termination of the compensation contract with the agent. On the other hand, the agent may physically control the payoff such that he can consume the difference between the outcome received and the amount he is contracted to pay to the principal.

We first (Section 18.1) consider the setting in which a risk neutral principal "owns" the outcome. In that setting all risk is ideally borne by the principal and a performance measure is beneficial if it permits the principal to impose less risk on the agent while still inducing a given action (or permits inducement of a more preferred action). In Section 18.2, a risk averse agent "owns" the outcome. In this setting a performance measure has two potential roles: as a mechanism to facilitate the sharing of the agent's outcome risk, and as a mechanism to provide incentives for the agent's action. Section 18.3 considers the setting in which a risk averse principal "owns" the outcome. This provides results similar to those in Section 18.2. However, in that section we focus on a setting in which there are both economy-wide and firm-specific risks and the principal is

a partnership of well-diversified shareholders. While well-diversified shareholders are risk neutral with respect to firm-specific risk, they are risk averse with respect to the economy-wide risk. We show how their risk preferences with respect to economy-wide risk can be represented in a simple way by using risk-adjusted probabilities for the economy-wide events, and illustrate how this translates into an optimal compensation scheme. Section 18.4 considers optimal costly acquisition of a secondary performance measure conditional on a primary performance measure. Section 18.5 concludes the chapter with some brief remarks.

18.1 RISK NEUTRAL PRINCIPAL “OWNS” THE OUTCOME

The simplest case to consider is one in which the principal is risk neutral and he ultimately receives the output x , so that there are no risk sharing concerns – only incentive issues. In Section 18.3 we consider the setting in which the principal is risk averse.

Basic Elements of the Model

The agent again chooses an action $a \in A$, which generates an outcome $x \in X$. The contractible information is denoted $y \in Y$, which is the outcome of an *information or performance measurement system* η . It can be multi-dimensional and may include x , but we allow for the possibility that x may not be part of y . We assume X and Y are finite sets to avoid potential technical problems associated with convex sets. However, given suitable regularity, the analysis can be extended to settings in which X and Y are convex sets – and much of the literature assumes that to be the case.

The joint probability function over $X \times Y$ given action a and performance measurement system η is denoted $\varphi(x, y|a, \eta)$, and the marginal probability functions are $\varphi(x|a)$ and $\varphi(y|a, \eta)$. We assume the cost of the information system is separable, so that η does not affect the gross payoff x .

The principal is assumed to be risk neutral, while the agent is risk and effort averse with an additively separable utility function:¹

$$u^p(\pi) = \pi = x - c, \quad u^a(c, a) = u(c) - v(a), \quad u' > 0, u'' < 0, v' > 0, v'' \geq 0.$$

Principal's Decision Problem

For the main part of the analysis we focus on the first stage of the Grossman and Hart (1983) (GH) approach in which we identify the least expected cost contract

¹ The analysis can be readily extended to consider a multiplicatively separable utility function.