

**DETERMINANTS OF THE USE OF FINANCIAL INCENTIVES
IN INVESTMENT BANKING**

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Abstract

This paper examines the use of incentive pay schemes within the financial services sector in London. Various theories of wage determination are reviewed with particular attention placed on the principal-agent literature as a framework for analysing the use of incentive pay. This is combined with case study interviews and a number of hypotheses regarding the use of bonuses. Quantitative analysis of a detailed industry-wide survey validates the hypothesis that those occupations where output is easily identifiable receive higher bonus pay. The proximity of an occupation to the revenue generating activity within the organisation is also found to be significant in determining bonus levels, as is job grade within the organisation. The paper concludes that principal-agent theories of wage determination are useful in understanding the use of bonus pay in the City, but need to be modified to take account of particular institutional characteristics, in particular the power of individual agents.

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I. Introduction

The use of variable pay schemes has recently attracted attention in both academic and professional circles. This interest has been heightened by the increased use of such schemes across most sectors of the economy. Economic theory has long predicted the potential of a payment system to increase the productivity of workers. In situations where employers cannot accurately assess whether an employee is working sufficiently hard, theory suggests that performance related pay schemes are a way that sufficient worker effort may be elicited. The question facing both researchers and managers is the extent to which these variable pay schemes achieve their aim of increasing labour productivity.

The financial services sector is exceptional in its use of bonus pay. The sector is characterised by both high levels of remuneration and near universal coverage of bonus pay amongst employees. The proliferation of consultancy activity directed at remuneration in the City is testament to the importance attached to payment systems in that sector. Financial services, and investment banking in particular, are characterised by both distinct product markets and occupational structures. These characteristics, combined with the ubiquitous nature of bonus pay, serve to make the financial services sector well suited to an empirical investigation of the determinants of pay.

Despite the strong interest in the economics of pay, there is relatively little empirical work on the subject. The majority of the work that exists is concentrated on the effectiveness of chief executive pay. These studies tend to concentrate on the incentive effects of granting shares or share options to senior management. There has been little written about the effectiveness of incentive pay for employees lower down the organisational hierarchy. Similarly, despite the theory being rich with testable predictions, there are precious few empirical studies on the subject of a firm's choice of payment system. This shortage of empirical work is amplified when it comes to the financial services sector. This is in part due to the difficulty of obtaining data in such a competitive market, where remuneration is treated as highly sensitive.

The main theory used in this research is the principal agent model. The principal agent problem is said to exist when there is an information asymmetry between principals and agents or, in this case, managers and workers. The theory

suggests that in the absence of perfect monitoring, the provision of an incentive contract should ensure that the agent puts forth sufficient effort. Such contracts will lie along a spectrum between the provision of income insurance on the one hand, and the provision of incentives on the other. The model predicts a number of variables that will be associated with particular forms of payment system. The purpose of this paper is to test how satisfactory principal agent-theory is in explaining the observed pay patterns in the financial services sector. In addition to looking at principal-agent theory, other factors such as the bargaining power of employees will be examined and evaluated in the light of the data.

This paper will draw upon both quantitative data and case study interviews. Survey data at the industry level will be used to analyse the use of variable pay in financial services. The quantitative data will be used to examine the patterns of bonus pay in the financial services sector and form the basis for statistical tests designed to evaluate the predictions of theory. The case study interviews will be used to outline the characteristics of pay setting in the financial services sector and confirm many of the predictions contained in the principal-agent literature.

Statistical techniques will be utilised to assess the validity of various theoretical hypotheses. The measurability of output, job grade within the organisation, and a measure of marginal product will be tested to see how well they are associated with variations in both salaries and bonus levels. The results are mixed, but broadly supportive of the predictions of principal-agent theory. The paper ends with the conclusion that the principal-agent framework is useful in understanding the use of bonus pay in the financial services sector, but that it needs to be extended to take account of occupationally specific ‘hold-up’ problems brought about by coercive employee power in the labour market.

II. The Theory and Evidence of Incentive Provision

It has long been recognised that the market for labour does not behave in the same way as those for other commodities. A variety of features combine to make the analysis of the exchange of labour services more complex than simply the interaction of supply and demand; ‘the variable to be determined is not a price but a complicated functional relationship’ (Arrow 1985, p44). Principal-agent theory is an attempt to better explain this relationship. It, therefore, provides a valuable starting point for analysing the choice of payment system.

The employment relationship may be characterised as a principal-agent problem in that the principal (employer) pays the agent (employee) to undertake work on

his behalf. The principal-agent problem becomes analytically interesting when: a) the agent's action is not directly observable; or b) output is not completely determined by the agent's effort. These can be termed the 'hidden action' and 'hidden information' problems respectively (Arrow 1985). In the former, worker effort is the hidden action and is also a source of disutility to the worker. In the latter case, the agent has information that is not revealed to the principal, who cannot thereby check to see that the information is being used in an appropriate manner.

There emerges a problem of incentives. The principal must design a contract that maximises his expected utility given that the agent will act to maximise his own utility arising from the compensation scheme. The principal must, therefore, offer sufficient rewards to induce the agent to accept the contract, the so called 'participation constraint'.

The classic case of share cropping between landowners and tenant farmers illustrates the basic features of the principal-agent model (Stiglitz 1974). The landowner is assumed to be able to costlessly measure the quantity and quality of output, whilst the direct monitoring of the farmer's work effort is taken to be prohibitively expensive. The landowner is therefore faced with designing an output based reward structure to motivate the farmer to work the land efficiently. A simple incentive contract would be for the owner to charge the farmer a fixed fee in return for the farmer being able to sell the produce from the land. However, since the output of the farm is not wholly attributable to the farmer's effort the incentive scheme outlined will expose the farmer to variations in income resulting from random variations in factors outside his control, most obviously the weather.

The landowner is assumed to be risk-neutral. As a result he is in a position to offer the tenant farmer an insurance contract, whereby the farmer is paid a fixed wage and the farm output accrues to the landowner. When the agent is insured against bad outcomes his interests are no longer perfectly aligned with those of the principal; there is no incentive to exert effort in order to avoid bad outcomes (Sappington 1991). The optimal contract will, therefore, be one in which the farmer is paid a fee that is less than his alternative wages but he will also receive a share of the farm's output. The size of the fixed-fee component will rise with the farmer's risk aversion and will decrease when greater effort incentives are needed (Stiglitz 1974; Nalebuff and Stiglitz 1983). Thus contract choice falls on a spectrum with the provision of risk sharing at one extreme and the provision of incentives at the other (Stiglitz 1987).

The principal-agent problem can be applied to understanding the choice facing firms regarding the optimal payment system. Many of the principal-agent models, including the sharecropping example outlined above, assume that principals have information regarding the agent's output. The problem arises from this output being partly determined by environmental factors. The principal is left with the task of obtaining some measure of the agent's effort in an attempt to insure them against fluctuations in income (Brown 1990). An adaptation of this model has been proposed, whereby a firm does not know the level of worker output unless some form of output monitoring is undertaken (Lazear 1986).

In his paper Lazear examines: *'the choice between a fixed salary for some period of time, that is, paying on the basis of input and paying a piece compensation that is specifically geared to output'* (Lazear 1986, pp.405-6). Fruit picking is illustrative of the extreme case of a pure piece-rate system where an amount of payment per unit of fruit harvested is specified in advance. Lazear argues, however, that many other occupations exhibit characteristics that can be effectively treated in the same way. The distinction drawn is that between a system where there is a *'synchronisation between output and compensation'* on the one hand, and salaries on the other, which implies that a worker's pay is independent of output (Lazear 1986, p407).

Much of the existing literature on principal-agent theory seeks to evaluate the effectiveness of incentive pay as a motivating device. The purpose of this paper is not to add to that body of work, but rather to explain the choice of payment system facing firms in the financial services sector. One study that seeks to do something similar is Brown (1990). He proposes a choice of three pay schemes; piece-rates, merit pay and standard time rates all associated with different monitoring costs. A list of factors that are significant in determining a firm's choice of payment system emerges, which include establishment size, occupational concentration within a firm, the diversification of duties within a particular occupation, and the degree of teamwork required in the production process (Brown 1990)

The fundamental prediction underlying the above analysis is that the use of variable pay schemes is inversely related to the costs of monitoring worker effort. This leads to the prediction that bonus pay will be more prevalent in occupations where performance is readily measurable. This paper will assess the extent to which this is true in the context of the UK financial services sector.

III. Methodology and Data

Gaining research access to financial institutions is difficult. The dearth of empirical data on this sector of the economy is testament to this fact. The sensitivity of remuneration data in a highly competitive sector was the reason usually cited by institutions in declining to participate in the research. Despite the considerable problems in gaining access, a cross sectional sample of six case studies was established. Factors such as firm size, nationality of ownership and occupational dispersion within a firm influenced the choice of case study institutions. The final sample contained British, continental European and Japanese institutions. The size of the firms ranged from the very small to the large and there was a mix of specialised organisations and those that provided a full range of banking services.

The interviews were designed to gain information about both the process of pay setting and the factors that were important in determining the structure of remuneration. Five of the six interviews were conducted with either personnel managers or senior managers in the institution. All of the interviewees had a detailed knowledge of remuneration management across the whole of their institutions. The interviews were semi-structured in nature. This was to allow comparability across the sample but also to encourage as wide a discussion of pay policy as possible. Therefore, the case studies were not primarily used as a source of quantitative data, but rather as a means of understanding the institutional context of pay setting in the financial services sector.

Quantitative data on pay in the financial services sector is difficult to obtain due to the institutions' concerns over confidentiality. However, an invaluable, yet untapped, source of quantitative data comes in the form of third party consultant's pay surveys. One of the best established of such surveys is the *International Banks and Investment Houses, Remuneration Guide* published by the Monks Partnership (Monks Partnership 1997). This survey series has been conducted since 1990 and is published quarterly. The data contained in the survey provide a good picture of pay practice in the city due to the fact that it gathers data from over 150 institutions. The validity of the data is enhanced further by the fact that they form the basis of pay setting in the sector itself. The fieldwork interviews revealed that consultant's surveys, including the one published by the Monks Partnership, were an important tool in determining the market level for both salaries and bonuses. The data can, therefore, be viewed as an authoritative source of information on pay practices in financial services.

The survey used for the detailed analysis in this paper is that which was published in August 1997. The dataset contains information that was collected

from 171 institutions and contains data for both base salary and bonuses. The data are presented in the form of occupational summaries; for 349 separate job titles there are data on mean base salary and mean bonus (expressed as a percentage of base salary). These figures represent the average bonus and salary levels across all firms that have employees in that occupation. The main drawback of the dataset is the absence of information regarding firm size. This is unfortunate since one of the stronger predictions of theory is that the use of variable pay schemes will be positively associated with the size of the firm. However, there is no evidence that there is any selection bias in the Monks Partnership sample with regard to firm size. Therefore, it provides a solid basis to test the predictions of principal-agent theory with respect to the use of bonus pay in the financial services industry.

IV. The Institutional Characteristics of Pay Setting in the Financial Services Sector

The qualitative interviews confirmed that there is a complex matrix of factors that influence the amount of bonus an individual receives and the process by which it is arrived at. A senior remuneration consultant who had experience of designing pay systems in the financial services sector suggested four fundamental variables: the degree of individual power, the economic value that is being created, the complexity of that value and finally, the degree of teamwork required. These insights correspond strongly with the predictions of theory and will be examined in further detail.

The degree of individual power refers essentially to the bargaining power of the individual with respect to the firm. This power derives from the fundamental problem of economic scarcity. One bank that was interviewed explained that their strategy for allocating the bonus pool was to protect the ‘crown jewels’ and prevent them from leaving the organisation. According to more than one interviewee, banks often pay above the market clearing level in order to retain the services of the individual and the associated revenue stream. This was not an isolated comment and many institutions spoke of the difficulty in reconciling the wage demands of high achievers with the desire to retain some kind of internal consistency in remuneration levels.

This phenomenon is consistent with Williamson’s analysis of ‘hold-up’ in the employment relationship (Williamson 1985). Where the individual has firm specific human capital then both parties will have an interest in the employment relationship continuing, and the employee may be able to appropriate higher wages from the employer in return for not quitting. In the case of financial

services this mechanism may be skewed even further in favour of employees. If the human capital of the employee is not fully firm specific but highly desirable by competitor firms, then the hold-up problem is heightened. This is likely to be the case in the City due to the shortage of specialised labour in the sector. Due to the lack of firm specific human capital the employee can quit with little cost to himself whereas the firm has a strong incentive to retain the services of the employee. This provides a strong theoretical basis for the high bonus levels that are observed in the City.

That remuneration is linked to the economic value being created is consistent with economic theory. The marginal revenue product theory of wages predicts that since the value created by some individuals in the city is exceptionally high wages should follow suit. The notion of marginal productivity is intrinsically difficult to quantify. During the course of the interviews, however, it became apparent that managers have a conception of a worker's marginal product, which is expressed in terms such as 'economic value' and 'revenue generation'. There is an accepted classification system of 'front', 'middle' and 'back' office functions that implicitly refers to the marginal revenue product of the employees within them. The significance of this recognition of the importance of marginal revenue product in pay setting should not be underestimated and will be the subject of further analysis. The level of value created will not just be a function of individual effort however, and is likely to be related to occupation, job grade and prevailing market conditions.

The complexity of the value refers to issues such as whether it is discrete in the sense of being fully under the influence of the agent or alternatively contingent on factors outside the individual's control and the time frame over which the value is created. Principal-agent theory predicts that incentive contracts will be more successful where the costs of monitoring output are lower. The determinants of complexity will again vary according to the business environment in which the individual is working.

The degree of teamwork called for is important in determining the basis for reward. The interviews revealed a universal recognition that if you offer incentives based purely on individual financial targets then you will encourage individualistic behaviour, or as one interviewee put it people with 'sharp elbows'. Therefore, in occupations where there is a requirement for people to work in teams, the design of bonus schemes will reflect this. Again, this supports the predictions of theory (Brown 1990).

There are strong interactions between these four factors. The power of the individual with respect to the institution will be positively related to the

economic value they create and negatively related to the complexity of that value and the degree of teamwork required creating it. Despite the difficulty in disentangling the individual factors at work from each other, this framework provides a useful basis for analysing the process of individual bonus determination. Furthermore, it can be used to yield predictions about the patterns of pay that are observed in the financial services sector.

A factor which has not been mentioned thus far but which is central to the process of bonus determination is that of observability. The theoretical importance of this relationship has already been noted. It's importance was confirmed by the interviews, with one interviewee conceding that *“to some extent [the salary-bonus relationship] depends on the ability to measure someone's contribution; with trading it's a lot easier since you can see the trade someone's done and whether they've made a profit or loss.”*

V. An Empirical Evaluation of the Use of Bonus Pay

Univariate Analysis of variance (ANOVA) techniques will be used to assess the validity of the hypotheses regarding the determinants of base salary and bonus levels. ANOVA analysis is appropriate for situations where the dependent variable is continuous and the independent variable is ordinal. The ANOVA technique tests whether the difference in means between the categories of the dependent variable are statistically significant. An R square value is also returned giving an indication of the goodness-of-fit of the model. An important assumption of parametric tests of this type is that the data is normally distributed. As is common with most income data, the survey data was positively skewed. In order to correct this the salary data was transformed by taking natural logs (Tabachnick and Fidell 1996). In this way it will be possible to use the more powerful parametric techniques such as ANOVA tests.

The Observability of Output

A central prediction of the principal-agent literature is that performance-related pay systems will be more prevalent in activities where the output is more easily quantified. The fieldwork interviews also identified the extent to which an individual's output is measurable as an important determinant of bonus levels. There was a universally held view that bonuses will account for a greater proportion of overall pay in those occupations where output can be most easily quantified. This prediction can be formally expressed as the following hypothesis:

Hypothesis 1

The level of bonus received is positively associated with the measurability of an individual's output

In order to test this hypothesis statistically, the measurability of the 349 jobs in the survey had to be assessed and expressed on a numerical scale. Descriptive information contained in the dataset combined with insights gained from the qualitative interviews formed the basis for the creation of a categorical variable to describe the measurability of output.

Table 1. *The Classification of the Measurability of Individual Output*

<i>Category</i>	<i>Characteristics of Individual Output</i>
Easily Measurable	Immediately quantifiable (e.g. the margin made on trading a financial asset) Identifiable in the short term Individually determined
Somewhat Measurable	Quantifiable only in the medium to long term May accrue as a result of teamwork May be increasingly subject to factors outside the agent's control
Not Easily Measurable	Little/no identifiable output to measure

Table 1 illustrates the classification system used to quantify the measurability of output in the survey data. Whilst the number of categories is small at only three, this enables the hypothesis to be tested whilst reducing the problem of arbitrariness in the assignment of occupations to particular categories. Examples of occupations with high observability are trading functions where the profitability of any transaction is quickly identifiable. Those occupations in the middle category include other banking services such as corporate finance and other fee-earning activities where output may accrue over a longer time period and be subject to factors outside the agent's control. The last category for occupations with little or no observable output will include most support services and banking services such as marketing and client administration where there is no objectively measurable output. By classifying the entire dataset into this three point ordinal scale it will be possible to statistically test the prediction of principal-agent theory encapsulated in hypothesis 1.

The discussion thus far has concentrated on the link between measurability and bonus levels. The theoretical basis for this link has already been outlined. There

is no expectation that measurability of output should be related to base salary in the same way. The determination of salary levels is likely to be caused by a variety of factors, some of which will be highlighted later in this paper.

The data in Table 2 indicate that both salary and bonus levels are statistically associated with the measurability of output. As measurability increases so too does mean salary, from just under £28,000 for occupations where output is not easily measurable to over £68,500 where it is highly measurable. The relatively low R square value indicates that the differences in the measurability of output only accounts for 39% of the variation in mean salaries. Thus, although there is an association where theory might not predict one, it is moderately weak.

Table 2. *Mean Salary and Bonus by Measurability of Output*

<i>Measurability of Output</i>	<i>Mean Salary £s^a</i>	<i>Mean Bonus (% of Salary)^a</i>
Not Easily Measurable	27,742*	9.6*
Somewhat Measurable	51,728*	20.2*
Easily Measurable	68,596*	28.8*
<i>Total</i>	<i>37,773</i>	<i>13.8</i>
R Square	.390	.410

^a These figures were calculated by anti-logging the values for ln (salary) and ln (bonus) that were used in the ANOVA

* The mean difference between this figure and all others is significant at the 5% level.

The results also confirm the hypothesis that measurability and bonus are positively associated. The difference in mean bonus between the three categories of measurability is significant at the 5% level. The data show that in occupations where measurability is high, the level of bonus pay will be approximately three times higher than in those positions where there is little or no observability of output. The level of the R square indicates that just over 40% of the variation in bonus levels is attributable to differences in measurability. Whilst this figure is relatively low, it is higher than the corresponding figure for salary levels. The implication is that the measurability of output is a marginally better predictor of bonus levels than it is of salaries. This corresponds to the prediction of principal-agent theory.

The Economic Value Created

Principal-agent theory is only a partial theory of wage determination. The most comprehensive theory in neoclassical economics is that concerning the marginal revenue product of labour (MRPL). The MRPL is defined as the extra revenue obtained by selling the output an extra worker produces. According to the theory, in a perfectly competitive market, the wage is set equal to the MRPL. Thus, in part, an individual's remuneration is determined by the value of the output being created.

This assertion was mirrored in the interviews, where there was a recognition of the importance of marginal revenue product. Interviewees spoke in terms of the 'economic value' or degree of 'revenue generation' being an important determinant of pay. Although an imprecise proxy for marginal product, the importance of some measure of 'economic value' to the process of pay setting is clear. Thus, the combination of theoretical insight with case study data can be used to generate a hypothesis, which will be empirically tested:

Hypothesis 2

Wages (salary and bonus) are positively associated with the 'economic value' created by the individual

The interviews confirmed the importance of revenue generation in wage determination. Unlike the case of measurability of output, there is no clear-cut theoretical reason why this phenomenon should apply to bonus levels more than base salaries. The interviews highlighted the fact that certain low-earning banking functions receive low bonuses whilst those support functions that are specifically identified with revenue earning activities often receive higher bonuses, despite a relatively low measurability of output. Thus, the 'economic value' being created by an individual may be a significant determinant of both salary levels and bonuses.

In order to empirically test hypothesis 2, a scale of the economic value created by each of the 349 jobs in the survey is required. Within the financial services sector there is an accepted classification system for different areas of activity within an organisation, namely 'front', 'middle' and 'back' office. The classification refers to the extent to which an occupation is involved with the process of direct revenue creation.

Front office staff re those involved in revenue generation activities, which include dealers, corporate financiers as well as those involved in selling the

bank's services to other institutions or individuals. Analysts and researchers are also included in the front office category, despite the fact they do not directly earn revenue for the bank. Their inclusion is merited by the fact that, as one interviewee put it, *'they are pivotal in creating house views'* and are an integral part of the success of the business.

This classification system provides an ordinal scale for measuring the economic value created by an individual jobholder. According to the MRPL theory of wage determination, those individuals in the front office should receive higher wages than those in the middle and back offices. By classifying each individual position within the dataset as a front, middle or back office function, it will be possible to statistically test this assertion. In particular, it will be possible to examine the relative strength of the theory in terms of its application to bonus levels and salaries.

Table 3. *Mean Salary and Bonus by Office Activity*

<i>Office Activity</i>	<i>Mean Salary £s^a</i>	<i>Mean Bonus (% of Salary)^a</i>
Back Office	22,883*	8.2*
Middle Office	39,922*	13.1*
Front Office	62,012*	25.2*
<i>Total</i>	<i>37,773</i>	<i>13.8</i>
R Square	.480	.442

^a These figures were calculated by anti-logging the values for ln (salary) and ln (bonus) that were used in the ANOVA

* The mean difference between this figure and all others is significant at the 5% level.

The hypothesis that the proximity to revenue generating activities is positively associated with base salaries is supported by the data in Table 3. Individuals working in the front office receive on average nearly three times the salary as those working in the back office. The value of the R square means that nearly half of the variation in salaries can be accounted for by an individual's proximity to certain areas of activity in the organisation.

The results in Table 3 also confirm that there is an association between the proximity of an occupation to revenue generation and the bonus level. The data show that whilst the difference between mean bonus levels in the middle and back office is statistically significant at the 5% level it is relatively small. This contrasts strongly with the mean bonus received by individuals in the front office, which is almost double of that for the middle office. The R square value of .442 indicates that almost 45% of the variation in bonus levels is accounted

for by differences in the office of activity. This figure is marginally lower than the corresponding figure for salary levels. This finding is also consistent with hypothesis 2, since the MRPL theory can apply equally to fixed and non-fixed pay. Thus, the importance of where an occupation is situated in relation to the process of revenue generation in determining wage levels has been established.

The Effect of Job Grade on Pay

Job grade within an organisation is likely to be positively associated with remuneration. This phenomenon is not restricted to the financial services sector and the factors behind it are well understood. Job grade may be taken as a proxy for a number of employee characteristics, each of which is positively associated with wages. Human capital theory (e.g. Becker 1964) states that as workers acquire both general and firm-specific human capital their productivity rises and this is reflected in increased wage levels. Job grade is also associated with extra responsibilities including that of management, thus, as the demands of the job increase, so too will the compensation. If promotional tournaments are utilised as a management tool then job grade may be associated with higher worker quality, which again should be reflected in higher wages. The relationship between job grade and pay can be formally stated by the following hypothesis:

Hypothesis 3
Pay will be positively associated with job grade

An ordinal variable measuring job grade was created using the occupational descriptions contained in the dataset. A five-point scale was used to avoid the possibility of arbitrariness. Table 4 summarises the measure.

Table 4. *The Classification of Job Grade*

<i>Management Level</i>	<i>Job Characteristics</i>
Head of Department	A general management or in charge of department High staff responsibilities
Manager	A manager/assistant manager of an area of banking activity Has specialist staff working under them
Senior Position	A senior specialist May have staff working under them
Standard Position	An analyst or officer May guide junior staff
Junior Position	A junior position in the department No staff responsibilities

This classification of management grade will be used to statistically test the relationship between grade and pay. It is expected that the theoretical relationship outlined above will be more evident in base salaries than it is in bonus levels. This is partly due to the fact that at high levels of seniority the form that incentive pay takes is not confined to a cash bonus. As job grade increases within the organisation, the likelihood of being partially remunerated by share-based schemes rises (Jensen and Murphy 1990). Since the dataset concentrates on salaries and bonuses, therefore, the implication is that job grade will be most strongly associated with salary levels.

Table 5. *Mean Salary and Bonus by Job Grade*

<i>Level of Seniority</i>	<i>Mean Salary £s^a</i>	<i>Mean Bonus (% of Salary)^a</i>
Junior Position	18,965 [†]	7.9***
Standard Position	30,006 [†]	11.1**
Senior Position	41,411 [†]	14.3*
Manager	54,932 [†]	18.5**
Head of Dept	102,282 [†]	36.7***
<i>Total</i>	<i>37,773</i>	<i>13.8</i>
R Square	.687	.392

^a These figures were calculated by anti-logging the values for ln (salary) and ln (bonus) that were used in the ANOVA

[†] The mean difference between this figure and all others is significant at the 5% level. *** The mean difference between this figure and all others is significant at the 5% level. ** The mean difference between this figure and that for a 'senior position' is not significant at the 5% level. * The mean differences between this figure and those for a 'senior position' or 'manager' are not significant at the 5% level.

The data in Table 5 summarise the association between the level of job grade and salaries and bonus levels. An employee in a 'junior' position will receive on average just under £19,000 whilst a senior individual such as a head of department will be paid over £100,000 in basic salary. The differences in means between the five categories of job grade are all highly significant at the 5% level for salary levels. The high R square value of .687 is noteworthy in that it indicates that over two thirds of the variation in base salaries can be accounted for by the level of job grade as defined here. The implication that job grade is the single most important determinant of salary is coincident with the predictions of both theory and an understanding of the sector.

The results for bonus levels are more ambiguous. Although the ANOVA is significant at the 5% level, post-hoc analysis of pair-wise differences show that

not all of the differences between the group means are significant at the 5% level. Specifically, the mean bonuses of junior staff and heads of department are significantly different from all other categories, whereas there is more ambiguity in the middle three ranks of the seniority scale. This contrasts with the analysis of job grade and salary levels where there was a clear and unambiguous difference between group means. The R square of .392 indicates that less than 40% of the variation in bonus levels can be explained by differences in seniority. Again, this contrasts strongly with the earlier analysis of the effect of job grade on salary levels where the value of R square was .687. Thus, the hypothesis that job grade is more strongly associated with salary levels than it is with bonuses is supported by the data.

A Model of Bonus Determination

The various theories of wage determination treat the fixed and non-fixed components of pay as analytically separate. From the preceding discussion of the hypotheses emerging from the literature on wage theory and the interviews it is clear that the determinants of base salary on the one hand, and bonuses on the other, are different. Therefore, an obvious first step in analysing the determinants of bonus pay is to examine the extent to which this is true. If the determinants of fixed and non-fixed pay are indeed different, there should be little correlation between salary and bonus levels. This hypothesis can be tested by running a simple bi-variate linear regression of the following form:

<p>Model 1</p> $\ln(\text{bonus}) = \alpha + \beta \ln(\text{salary}) + \varepsilon$

It should be noted that bonuses are expressed as a percentage of base salary. The results of the regression are presented in Table 6. The first line of the table shows the value of β is significant at the 5% level indicating that there is a statistical association between base salary and bonus. The relatively high R square value of .663 indicates that two thirds of the variation in bonus levels can be accounted for by variations in base salary.

This finding is seemingly at odds with the theoretical prediction that the two types of pay are influenced by different factors, and therefore, should not be related. One implication of the relatively high degree of association between salaries and bonuses is that bonus pay is not only used as a tool to overcome the principal-agent problem, but is also a means of augmenting the total

remuneration offered to employees in order to satisfy the demands of the labour market.

Table 6. *The Relationship Between Base Salary and Bonus*

<i>Model</i>	<i>Coefficient β</i>	<i>R Square</i>
Whole Sample	.964**	.663
Output Not Easily Measurable	.786**	.599
Output Somewhat Measurable	.966**	.450
Output Easily Measurable	.716**	.318

** Significant at the 5% level.

However, examining the salary-bonus relationship in the light of the predictions of principal-agent theory yields a different picture. A major prediction of the theory is encapsulated in hypothesis 1, namely that the bonuses will vary with the measurability of output. In the context of the salary-bonus relationship this leads to the prediction that the correlation between salaries and bonuses will be lower as the measurability of output increases.

Table 6 includes results from linear regression analysis of the above model using different subsets of the data. The dataset was split according to the measurability of output of the occupations. The results are all significant at the 5% level. The value of R square, which indicates the goodness-of-fit of the model, falls as the measurability of output rises. Whereas almost 60% of the variation in bonus levels is accounted for by variations in salary for occupations with low measurability, this figure almost halves for occupations with high measurability of output. The fact that the relationship between salaries and bonuses is weaker in those occupations where theory suggests PRP schemes will be more successful is important in that it indicates that bonus determination is a distinct process from that of salary setting.

The preceding analysis has concentrated on three distinct determinants of bonus determination and has found all of them to be statistically significant. In order to extend the analysis of bonus setting, statistical models will be constructed to examine in more detail the factors at work. The appropriate tool of analysis is the univariate ANOVA technique that examines how a continuous dependent variable is affected by differences in a number of ordinal independent variables. The model depicting the determinants of bonus pay takes the following form:

Model 2

$$\ln(\text{bonus}) = f(\text{job grade, economic value created, measurability of output})$$

Table 7 presents the results of running an ANOVA test on the above model. Unlike linear regression modelling, analysis of variance does not allow for an estimation of an ‘equation’ with coefficients for the variables. The results indicate whether or not the independent variables are significantly associated with the dependent variable.

Table 7. *Univariate ANOVA Results for Model 2*

<i>Factor</i>	<i>F - Statistic</i>	<i>Significance^a</i>
Corrected Model	18.437	.000
Intercept	2104.387	.000
Job Grade	16.536	.000
Economic Value Created	4.780	.009
Measurability of Output	3.322	.037
Seniority <i>by</i> Economic Value	1.128	.344
Seniority <i>by</i> Measurability	2.835	.005
Economic Value <i>by</i> Measurability	.807	.491
Seniority <i>by</i> Economic Value <i>by</i> Measurability	.938	.442
R Square	.648	

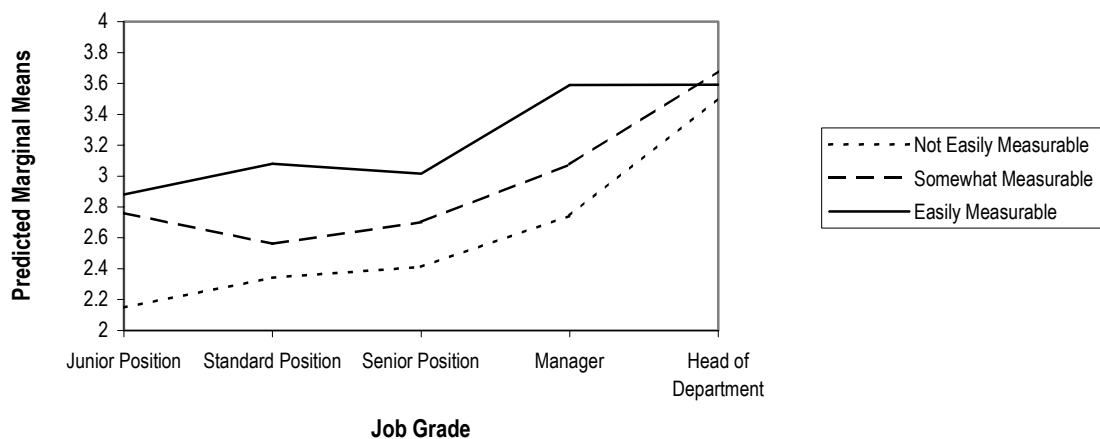
^a The significance level of the variable. A value below .05 indicates statistical significance at the 5% level.

The results in Table 7 show that bonus levels are significantly associated with the three factors that have been discussed. All of the main or individual factors are significant at the 5% level. Table 7 also shows the significance of the interactions between the various factors. An interaction indicates that the effect of one factor varies according to the value of another. From Table 7 it can be seen that there is a statistically significant interaction between job grade and the measurability of output. This implies that the effect of measurability on bonus levels is not even across different levels of job grade. This can be illustrated graphically by looking at a plot of predicted marginal means in Figure 1.

For there to be no interaction between the two factors, the three lines in Figure 1 would have to be parallel and distinct. The fact that this is clearly not the case indicates that the effect of the measurability of output on bonus levels varies according to the job grade of the individual. Across the middle three tiers of job

grade the lines are broadly parallel indicating the effect of measurability is fairly constant. This is what would be expected if there were no interaction between the variables; for a given job grade the more measurable output is, the higher the bonus will be. For both junior, and especially very senior positions, however, the effect of measurability on output changes. In junior positions, it appears to make very little difference if output is extremely measurable or only somewhat measurable. In the case of department heads the effect of measurability of output on bonus levels seems to break down completely, implying that bonuses will not depend to any meaningful degree on the visibility of output. This last finding is consistent with the practice of senior management being remunerated according to company-wide measures of performance, such as share-based schemes.

Figure 1. *The Interaction Between Job Grade and Measurability of Output on Bonus*



The result that for very senior positions, the relationship between output measurability and bonus level breaks down, is important. It is consistent with the ‘hold-up’ problem identified by Williamson (1985) and developed by Malcomson (1997). The theory suggests that where the employee embodies firm-specific capital it is in the interests of both parties to continue the employment relationship. In the context of heads of department in the financial services sector, the value of such firm specific information may be high. In these circumstances the employee may be able to hold-up the employer and extract higher remuneration (Malcomson 1997). Thus, the predicted relationship between the measurability of output and bonus levels will break down. This is analogous to changing the contract from one of incentive provision to one of risk sharing for the employee’s benefit (Stiglitz 1987).

It is, therefore, important to consider the effects of interactions between variables when interpreting the results of ANOVA tests like those presented in Table 7. The R square value of .648 for the model under investigation indicates that almost 65% of the variation in bonus levels is explained by the factors in model 2.

Earlier analysis concluded that there is an association between salary and bonus levels. In order to construct a model that better fits the data, this can be incorporated into the analysis as a covariate. Since there was a high degree of association between job grade and salary levels, job grade will be excluded from the analysis to avoid the problem of autocorrelation between the independent variables. The model under investigation takes the following form:

Model 3
 $\ln(\text{bonus}) = f(\ln(\text{salary}), \text{economic value created}, \text{measurability of output})$

Table 8 summarises the results of running a univariate ANOVA test on the above equation. The results show that the model is statistically significant at the 5% level. In this case, however, there is no significant interaction between any factors. This implies that the variables under investigation influence bonus levels in a discrete manner and can be treated as analytically distinct. The individual factors, together with the salary covariate, are all significant at the 5% level.

Table 8. *Univariate ANOVA Results for Model 3*

<i>Factor</i>	<i>F - Statistic</i>	<i>Significance^a</i>
Corrected Model	99.468	.000
Intercept	110.361	.000
Ln (salary)	253.556	.000
Economic Value Created	3.511	.031
Measurability of Output	6.093	.003
Economic Value by Measurability	2.454	.063
R Square	.704	

^a The significance level of the variable. A value below .05 indicates statistical significance at the 5% level.

The R square value of .704 shows an improvement compared to model 3 and indicates that including salary information improves the goodness-of-fit of the

model. It is also important to note that the R square value here is better than for the regression of salary on bonus indicated in Table 6. The important implication of this is that bonus levels can be better explained by a model including factors such as measurability of output and economic value created than by simply looking at salary levels alone. This adds weight to the hypothesis that bonus pay is a distinct tool of remuneration.

VI. Conclusions

This paper has examined the use of bonus pay in the financial services sector. The question that has been addressed is whether variations in payment systems can be explained by principal-agent theory. The principal-agent problem is said to exist when there is an information asymmetry between managers and workers. The theory suggests that in the absence of perfect monitoring, the provision of an incentive contract should encourage the agent to put forth sufficient effort. The contract choice facing a manager is one of providing income insurance, or risk sharing, on the one hand, and the provision of incentives on the other. The underlying prediction of the theory is that the use of bonus pay will be more prevalent where the cost of measuring worker output is lowest.

The results of the statistical analysis of industry level wage data have confirmed the importance in the measurability of output in determining bonuses. However, the analysis also found that there were other variables associated with the use of bonuses, thereby confirming the findings of the case studies. Both marginal revenue product, as measured by 'economic value,' and the job grade of the individual within the organisation were found to be significantly related to bonus levels. There were also found to be significant interactions between some of these variables.

Thus, the principal-agent framework does appear to explain the use of bonus pay, but only in part. It is undeniably true that the costs of measuring individual output are important in explaining the use of bonus pay. The existence of alternative determinants of bonus levels, such as marginal product and job grade does not in itself negate the validity of the principal-agent model. However, the results of the statistical analysis, combined with the insights gained from the case study interviews, suggest that principal-agent theory needs to be modified to take account of certain institutional characteristics of the financial services sector. In particular, the labour market power exercised by certain employees in the sector, is seen to frustrate the provision of incentives.

References

- Abowd, J.A. (1990) "Does Performance-Based Managerial Compensation Affect Corporate Performance?" *Industrial and Labor Relations Review*, **43**(3): S52-S73.
- Akerlof, G.A. (1982) "Labor contracts as partial gift exchange." *Quarterly Journal of Economics*, **97**(4): 543-69.
- Arrow, K. (1985) 'The economics of agency'. in J. W. Pratt and R. Zeckhauser (eds.) *Principals and agents: the structure of business*. Boston Mass, Harvard Business School Press.
- Asch, B.J. (1990) "Do incentives matter - the case of navy recruiters." *Industrial & Labor Relations Review*, **43**(3 SISI): S89-S106.
- Becker, G.S. (1964) *Human capital: a theoretical and empirical analysis, with special reference to education*, National Bureau of Economic Research; distributed by Columbia University Press.
- Brown, C. (1990) "Firms' Choice Of Method Of Pay." *Industrial & Labor Relations Review*, **43**(3): S165-83.
- Cannell, M. and S. Wood (1992) *Incentive pay: impact and evolution*, Institute of Personnel Management.
- Ehrenberg, R.G. and M.L. Bognanno (1990) "The incentive effects of tournaments revisited - evidence from the European PGA tour." *Industrial & Labor Relations Review*, **43**(3): S74-S88.
- Jensen, M.C. and K.J. Murphy (1990) "Performance pay and top-management incentives." *Journal of Political Economy*, **98**(2): 225-64.
- Encinosa, W.E., M. Gaynor, et al. (1997) *The sociology of groups and the economics of incentives : theory and evidence on compensation systems*. NBER Working Paper Series; no. 5953. Cambridge, MA., National Bureau of Economic Research.
- Fernie, S. and D. Metcalf (1998) *(Not) hanging on the telephone : payment systems in the new sweatshops*. London, London School of Economics Centre for Economic Performance.
- Garen, J.E. (1994) "Executive compensation and principal-agent theory." *Journal of Political Economy*, **102**(6): 1175-99.
- Gibbons, R. and K.J. Murphy (1990) "Relative Performance Evaluation for Chief Executive Officers." *Industrial and Labor Relations Review*, **43**(3): S30-S51.
- Green, J.R. and N.L. Stokey (1983) "A Comparison of Tournaments and Contracts." *Journal of Political Economy*, **91**(3): 349-64.
- Grossman, S.J. and O.D. Hart (1983) "An analysis of the principal-agent problem." *Econometrica*, **51**(1): 7-45.

- Hall, B.J. (1998) *The pay to performance incentives of executive stock options*. NBER Working Paper Series; no. 6674. Cambridge, MA., National Bureau of Economic Research.
- Hart, O.D. (1983) "Optimal labor contracts under asymmetric information - an introduction." *Review of Economic Studies*, **50**(1): 3-35.
- Hubbard, R.G. and D. Palia (1994) *Executive pay and performance : evidence from the U.S. banking industry*. NBER Working paper series; no. 4704. Cambridge, MA., National Bureau of Economic Research.
- Ittner, C.D., D.F. Larcker, *et al.* (1997) "The choice of performance measures in annual bonus contracts." *Accounting Review*, **72**(2): 231-55.
- Lazear, E. (1986) "Salaries and Piece Rates." *Journal of Business*, **59**(3): 405-31.
- Malcomson, J.M. (1997) "Contracts, hold-up, and labor markets." *Journal of Economic Literature*, **35**(4): 1916-57.
- Mirrlees, J.A. (1997) "Information and incentives: The economics of carrots and sticks." *Economic Journal*, **107**(444): 1311-29.
- Monks Partnership (1997) *International banks and investment houses: a remuneration guide*. Safron Walden, The Monks Partnership.
- Nalbantian, H.R. (ed.) (1987) *Incentives, cooperation, and risk sharing: economic and psychological perspectives on employment contracts*. Totowa, N.J., Rowman & Littlefield.
- Nalebuff, B.J. and J.E. Stiglitz (1983) "Prizes and incentives: towards a general theory of compensation and competition." *The Rand Journal of Economics*, **14**(1): 21-44.
- Pratt, J.W. and R. Zeckhauser (eds.) (1985) *Principals and agents : the structure of business*. Boston, Mass., Harvard Business School Press.
- Prendergast, C. (1999) "The provision of incentives in firms." *Journal of Economic Literature*, **37**(1): 7-63.
- Ross, S.A. (1973) "The economic theory of agency: the principal's problem." *American Economic Review*, **63**(2): 134-39.
- Sappington, D. (1991) "Incentives in principal-agent relationships." *Journal of Economic Perspectives*, **5**(2): 45-66.
- Stiglitz, J.E. (1974) "Incentives and risk sharing in sharecropping." *Review of Economic Studies*, **41**(2): 219-55.
- Stiglitz, J.E. (1987) 'The design of labor contracts: The economics of incentives and risk sharing'. in H. R. Nalbantian (ed.) *Incentives, cooperation and risk sharing*. Totowa, N.J., Rowman & Littlefield.
- Tabachnick, B.G. and L.S. Fidell (1996) *Using multivariate statistics*. New York, NY, HarperCollins College Publishers.
- Williamson, O.E. (1985) *The economic institutions of capitalism*. New York, Free Press.