IN THE COMPETITION APPEAL TRIBUNAL

Case No. : 1329/7/7/19
1336/7/7/19

Salisbury Square House
8 Salisbury Square
London EC4Y 8AP
(Remote Hearing)

Tuesday 13 July 2021

Before:
THE HONOURABLE MR JUSTICE MARCUS SMITH
(Chairman)
PAUL LOMAS
PROFESSOR ANTHONY NEUBERGER

(Sitting as a Tribunal in England and Wales)

BETWEEN:

MICHAEL O'HIGGINS FX CLASS REPRESENTATIVE LIMITED
Applicant/Proposed Class Representative

v

(1) BARCLAYS BANK PLC
(2) BARCLAYS CAPITAL INC.
(3) BARCLAYS EXECUTION SERVICES LIMITED
(4) BARCLAYS PLC
(5) CITIBANK, N.A.
(6) CITIGROUP INC.
(7) JPMORGAN CHASE & CO.
(8) JP MORGAN CHASE BANK, NATIONAL ASSOCIATION
(9) J.P. MORGAN EUROPE LIMITED
(10) J.P. MORGAN LIMITED
(11) NATWEST MARKETS PLC
(12) THE ROYAL BANK OF SCOTLAND GROUP PLC
(13) UBS AG
Respondents/Proposed Defendants

AND

AND BETWEEN:

PHILLIP EVANS
Applicant/Proposed Class Representative
- v -

(1) BARCLAYS BANK PLC

(2) BARCLAYS CAPITAL INC.
(3) BARCLAYS PLC
(4) BARCLAYS EXECUTION SERVICES LIMITED
(5) CITIBANK, N.A.
(6) CITIGROUP INC.
(7) MUFG BANK, LTD
(8) MITSUBISHI UFJ FINANCIAL GROUP, INC.
(9) J.P. MORGAN EUROPE LIMITED
(10) J.P. MORGAN LIMITED
(11) JPMORGAN CHASE BANK, N.A.
(12) JPMORGAN CHASE & CO
(13) NATWEST MARKETS PLC
(14) THE ROYAL BANK OF SCOTLAND GROUP PLC
(15) UBS AG

Respondents/ Proposed Defendants

A P P E A R A N C E S

Michael O'Higgins FX Class Representative Limited	Scott+Scott UK LLP	Daniel Jowell QC Gerard Rothschild Charlotte Thomas
Barclays	Baker & McKenzie LLP	Mark Hoskins QC
Citibank	Allen & Overy LLP	Max Evans
JPMorgan	Slaughter and May	Sarah Ford QC Daisy Mackersie
NatWest / RBS	Macfarlanes LLP	Tom Pascoe
UBS AG	Gibson, Dunn & Crutcher UK LLP	Brian Kennelly QC Paul Luckhurst Hollie Higgins
Phillip Evans	Hausfeld & Co. LLP	Aidan Robertson QC Victoria Wakefield QC David Baily Aaron Khan
MUFG	Herbert Smith Freehills LLP	Ronit Kreisberger QC Thomas Sebastian

Tuesday, 13 July 2021

(10.36 am)

THE CHAIRMAN: Good morning, everyone. If we could again wait for the live stream to catch up, I will indicate when we can properly begin.

(Pause)

THE ASSOCIATE: We are ready to start.

THE CHAIRMAN: Thank you.

Mr Robertson, I will invite you to introduce your witnesses, but just before you do, is there any housekeeping that I need to be apprised of? We have none on our part.

MR ROBERTSON: The only housekeeping that we have got is that we put in a note this morning on the *Merricks* point that was raised by Mr Hoskins yesterday and Ms Wakefield has responded to that with a note that was served this morning.

THE CHAIRMAN: Yes, we have seen and read that, so thank you very much.

MR ROBERTSON: In that case, I will turn to our expert witnesses. We have three: Professor Dagfinn Rime, who participated in the teach-in; we have Mr John Ramirez; and we have Mr Richard Knight. Each of them has served three expert reports, so a report that was served with Mr Evans' application and then two follow up expert reports.

In view of time, would the Tribunal be content to take them as adopted?

THE CHAIRMAN: We will take them as adopted and I think it would be not pointful to take them through and identify their signatures. I am quite satisfied that they have put forward these documents as their views and opinions. So we should proceed, I think, to affirming or swearing the witnesses, and then, unless you have got anything by way of questions beyond the usual in-chief questions, which we will take as read, we will move straight to cross-examination, if that is all right with you, Mr Robertson?

MR ROBERTSON: Yes, I am perfectly happy to move straight to cross-examination. We do not have any supplementary questions in-chief.

THE CHAIRMAN: Very good, well, in that case, if we start perhaps with Professor Rime. I wonder if the registry could affirm him.

PROFESSOR DAGFINN RIME (affirmed)

Thank you, Professor. Much obliged.

Mr Knight.

MR RICHARD KNIGHT (affirmed)

And finally, Mr Ramirez.

MR JOHN RAMIREZ (affirmed)

THE CHAIRMAN: Thank you all, gentlemen. You will have some questions from two counsel. Can I just say this. If any you have need a break for whatever reason, do please just let me know and we will accommodate it. We will customarily rise for five or ten minutes mid-morning anyway, but if there is any other need, please just let me know and we can adjust the timetable to reflect that.

Oh, I made the usual warning about recordings yesterday. I am not going to repeat my spiel in full, but what I said yesterday applies also today.

Mr Robertson.

MR ROBERTSON: Well, I think it is over to -- on the timetable, it is over to questions from the respondents to start.

THE CHAIRMAN: Mr Hoskins.

Cross-examination by MR HOSKINS

MR HOSKINS: I think that is my cue, sir.

Good morning, gentlemen. I am Mr Hoskins and I am the counsel for Barclays Bank. My questions are going to be primarily for Mr Ramirez. That is taking the bit of evidence I wanted to discuss with you this morning.

So Mr Ramirez, can we start by looking at your CV. Do you have the -- do you have paper copies of the bundles or do you have the electronic version that will show you the documents as I refer to them?

MR RAMIREZ: Sir, I have -- yes, I have the Ring Link, but I also have hard copies.

MR HOSKINS: Obviously whichever you prefer. I will give the reference and the electronic version will come up, but obviously if you want to look at your paper version, that is fine.

The reference is {EV/10/93}, and this is your CV, and you will see at the bottom of the page, there is the heading "Consulting Experience".

MR RAMIREZ: Yes, sir.

MR HOSKINS: You give some examples of cases in Europe, some of which look familiar to me having been in them, I have to say.

Also, if we go over the page, {EV/10/94}, you have experience in the United States.

Then over the page again, {EV/10/95}, you have experience in India.

MR RAMIREZ: Yes, sir.

MR HOSKINS: And then over the page, and some other examples of different types of instructions that you have had.

The question I wanted to ask you, first of all, was did any of the matters listed here go to trial?

MR RAMIREZ: No, sir, they did not -- well, some have gone to trial; the ones where I was the expert have not been to trial yet.

MR HOSKINS: So you have not given evidence to the court at a trial as an expert?

MR RAMIREZ: Not verbally, sir. The expert evidence has gone in. There is -- I believe, sir, there is a cement cartel case that is listed there. My evidence has (inaudible) in that matter, although it has not been tried yet, sir.

MR HOSKINS: Can we next go to, please, {EV/10/84}, and this is your letter of instructions from Hausfeld solicitors.

MR RAMIREZ: Yes, sir.

MR HOSKINS: And if we could go, please, to page 89, {EV/10/89}, you will see the heading "Your duties as an expert" and paragraph 28 says:

"Paragraphs 7.65 to 7.70 of the CAT's Guide to Proceedings (the Guide) provide guidance on giving expert evidence in the CAT. The CAT will take into account the principles and procedures relating to expert evidence set out in Part 35 and Practice Direction 35 of the Civil Procedure Rules (the CPR). Further guidance can be found in the Civil Justice Council Guidance for the instruction of experts in civil claims. These documents have been provided to you, separately."

Can I just confirm that those documents were indeed provided to you?

MR RAMIREZ: Yes, sir.

MR HOSKINS: And can you confirm that you read them?

MR RAMIREZ: Yes, sir.

MR HOSKINS: Then if we go to paragraph 30, it says:

"In particular, please note that your overriding duty as an expert is to the CAT. Your primary function is to assist the CAT and, in this capacity, you must provide your unbiased opinion as an independent witness in relation to those matters which are within your expertise."

Then 31:

"We also draw your attention to the following requirements for your Initial Report (and any subsequent expert reports)."

Then (b):

"You should express opinions that are independent, objective and unbiased on matters within your expertise."

(c):

"You should not assume the role of an advocate and you should not omit to consider material facts which could detract from your concluded opinion."

The question I wanted to ask you in relation to those was, you will see in (c), Hausfeld are saying you should not assume the role of an advocate and I wanted to ask you what do you think that means? How do you understand that obligation not to seek to perform the role of an advocate?

MR RAMIREZ: Yes, sir, I understand. How I interpret that is that I should essentially attend to my instructions in a way that satisfies them, but does not take a position either as to whether or not it would be helpful or harmful to Mr Evans' claim.

MR HOSKINS: Does the duty not to perform the role of an advocate therefore include an obligation to identify potential weaknesses in the claim and/or in your analysis?

MR RAMIREZ: In my analysis, yes, sir.

MR HOSKINS: Can we go to page {EV/10/82}, please, in the bundle. So this is the end of your first report. You see the heading, "Expert Duties", and then paragraph 186, you say:

"I understand my duty to the Court and am aware of the requirements under Part 35 of the Civil Procedure Rules and paragraph 7.67 of the Competition Appeal Tribunal Guide to Proceedings, and that this duty overrides any obligations to the party from whom I have received instructions. I confirm that I have complied and will continue to comply with this duty."

So, you are aware that the duty is a continuing one throughout your participation in the proceedings, yes?
MR RAMIREZ: Yes, sir.
MR HOSKINS: Are you aware that one of the purposes of this hearing that we are all now participating in is for the Tribunal to evaluate the teams of experts which each of the applicants, ie Mr Evans and Mr O'Higgins, seeks to rely upon?
MR RAMIREZ: Yes, sir.
MR HOSKINS: To use the words of Mr Robertson yesterday, it is a bit like a beauty parade.
Can we go, please, to page {EV/10/45} -- so we are still in your first report. Now, I am going to work through some of your evidence and I am going to give the same chance -- I want to make it clear, when I come this afternoon to the other set of experts, I am going to give them the same opportunity I am giving you, which is not simply, if you like, to say "I can produce a model" --
MR RAMIREZ: Yes, sir.
MR HOSKINS: -- but also to show the Tribunal that you are capable of identifying where the difficulties might lie, because that is consistent with your obligation, and I am going to give the same opportunity to the other set of experts as I am about to give you; do you understand?

MR RAMIREZ: I do, sir.

MR HOSKINS: So, page 45 in your first report, you see the heading, "Assessment of Overcharge", so this is section 6 of your first report. Do you identify any potential difficulties in relation to your posed proposed econometric methodology in your reports?

MR RAMIREZ: Well, sir, I do, in the sense that I acknowledge the limitations with respect to the data that we may have and then identify other potential sources of data that we can use in the regression analysis, and I noted that in certain instances, if data is not available, then we would have to use alternative sources. So, I think, in that respect, I have done my best to point out and identify adequate data and information.

I think, with respect to the data that we expect to use in the overcharge analysis from the defendants, in my report I noted -- after my review of the expert reports in the US, I noted that the data is undoubtedly complex and it will require a good amount of work, but the US litigation suggests that it is in fact feasible.

MR HOSKINS: So, one potential difficulty might be limitations of data or complexity of data; is that a fair summary?

MR RAMIREZ: Yes, sir.

MR HOSKINS: Are there any other potential difficulties that you anticipate in seeking to build a reliable econometric model to assess damages in this case? Are there any other broad categories of difficulties that might arise?

MR RAMIREZ: No, I would say, no, sir, although I would say that, of course, you are familiar with my instructions, my instructions are to -- essentially, the harm that has been identified by Professor Rime in his report, to set out a methodology or an approach for how that harm can be measured. When I look at the context of the harm that Professor Rime has identified, I feel that I will be able to measure the extent to which that harm impacted the classes, the two Evans classes, on a class-wide basis.

MR HOSKINS: Let us investigate that a little further.

The next document I would like to show you is in {B/16/1}. You will have to excuse me while I catch up with my paper copies.

MR RAMIREZ: Of course.

MR HOSKINS: So, as you will see from the title, this is a document produced by the European Commission, "Commission staff working document, practical guide, quantifying harm in actions for damages based on breaches of Article 101 or 102 of the Treaty ..."

Are you familiar with this guide?

MR RAMIREZ: Yes, sir.

MR HOSKINS: Can we go, please, to page 29 in this document {B/16/29}. Can I ask you to read to yourself paragraph 81, please.

MR RAMIREZ: Of course. (Pause)

Yes, sir --

MR HOSKINS: -- (overspeaking) --

MR RAMIREZ: (inaudible) Yes, sorry, it goes to the next page, sir {B/16/30}.

Okay, sir.

MR HOSKINS: So you will see in the second sentence of paragraph 81 the Commission say:

"In addition, it is necessary to have a good understanding of the industry concerned, in the first place, to formulate the right hypotheses when constructing the regression equation and to make the right choice as to the factors that are likely to have significantly influenced the variable of interest (and which should therefore be included in the analysis)."

Do you agree with that statement by the Commission?

MR RAMIREZ: Yes, sir. I think the overcharge model should be a theoretical and a factual basis with respect to the industry that you are analysing.

MR HOSKINS: Just to tease that out a bit more, why is it important that one should have a good understanding of the industry concerned in order to formulate the right hypotheses when constructing the regression equation? Can you just explain to us about why that is important?

MR RAMIREZ: I think there is -- there is important factors that relate to the industry that affect the variable of interest that we are modelling. In this case, of course, this would be the cost for the class members to access liquidity. Now, there is a variety of factors that are, of course, specific to the industry that may affect that. So, for example, the extent to which trades are conducted online versus over voice may affect that. So, there are certainly characteristics of the industry that would affect the half-spreads the class members paid.

It is also, of course, important to understand which economic factors influence half-spreads, and that, of course, is a confluence of industry knowledge and then, of course, the economic theory. In my second report -- sorry, my first report, sir, when I go through the explanatory variables, I indicate, after a review of the literature, which variables would be suitable and are used in the literature, or modelling the half-spreads paid by the customers.

MR HOSKINS: There is really two reasons given by the Commission why it is important to have good industry knowledge. One relates to the hypothesis upon which the regression equation is based, that is number 1, and number 2 is the choice of explanatory variables which then are used to populate the model.

Now, if one is in a situation where, for example, let us take the first one, the hypothesis upon which the model is based does not reflect the industry, what are the consequences, what are the likely consequences for the model?

MR RAMIREZ: Sir, could you repeat that again, please? I am sorry.

MR HOSKINS: Certainly.

I am asking you to assume a situation in which the hypothesis upon which the model is based does not reflect in some material way the reality of the industry.

MR RAMIREZ: Could you clarify -- I am sorry.

MR HOSKINS: And I am asking you what potential impact that would have on the reliability of such a model.

MR RAMIREZ: Right. Sir, could you clarify what you mean by "hypothesis"?

MR HOSKINS: Well, I am reading what the Commission has said and it seems to think that there are two reasons why you need a good understanding of the industry. One is to formulate the right hypothesis, and the second one is to make the right choice as to the variables. So my understanding of this is that there are two reasons the Commission is putting forward, one relates to the choice of variables, but one seems to be more generally related to the theory of harm, if you like, upon which the model is based and reflects. That is my understanding of it, but you tell me if you think differently.

MR RAMIREZ: No, I think -- well, there is any number of hypotheses that could be made, but of course, if there is a hypothesis that is related to the harm that we are measuring of overcharge arising from a cartel, of course, the hypothesis is going to be tested, and it will be tested in the sense that, if the harm is hypothesised to affect a certain amount of transactions and certain types of customers, broadly affect transactions in the market, that hypothesis is going to be built into the model. The consequence of that hypothesis not being correct is going to -- it is going to depend.

So, if the -- for example, if the hypothesis is that the market affected certain types of transactions but not others, then the model results will essentially reflect that in the results.

Now, an important part of that is, of course, the right choice of explanatory variables, which is the second part that is listed here.

MR HOSKINS: So let us go back to my question, which is imagine a situation -- you of course would never do this, but imagine an expert produced a model that did not reflect the reality of the industry. The theory of harm just was not a good one, it did not reflect reality. What would be the effect on the reliability of such a model?

MR RAMIREZ: Well, I think the model would be reliable in the sense that, to the extent it was well specified in terms of having the right variables, it would be reliable in telling whether or not the theory of harm was reflected in the empirical results.

So, you can think of the regression analysis essentially as a test of the hypothesis that is being developed.

MR HOSKINS: What if the explanatory variables were not an accurate reflection of reality? What would be the impact on such a model be?

MR RAMIREZ: Yes, well, I think then it depends, sir. The reason it depends is, of course, the explanatory variables that are in the model should give an accurate reflection of the factors that influence the variable of interest. In this case we are talking about the half-spread. Now, in terms of if the right variable is not in the model, there are -- it depends -- the context of the variable that is omitted. If the omitted variable is important and it has some correlation with the harm, then the harm that is potentially being measured will not be -- will not be accurate, and to the extent that variables are potentially omitted that are not necessarily correlated with the hypothesis, then it may not make a difference with respect to the results.

So, when we talk about omitted variables, it is important that we keep in mind what the characteristics of the variables are and how they relate to other variables in the model and other variables of interest --

THE CHAIRMAN: Mr Ramirez, I see Professor Rime has put his hand up, and I think, if you have something to add in relation to that answer, Professor, I would be minded to let you insert your addition.

PROFESSOR RIME: Yes, I think I have something to add there. So, in my view, judging from the academic literature on this topic, I would say that the hypothesis and the choice of variables are not too distinct, these decisions in this field, but they are closely related. So, the hypotheses or the theory of harm, do guide our choice of econometric model. For example, I would say that our estimation of what we call adverse selection cost is one such example where theory guide the selection of variables and the model.

THE CHAIRMAN: Thank you, Professor.

Mr Hoskins, I do apologise for, as it were, inserting another witness into your cross-examination, but I think we will proceed in this way, unless it becomes utterly unwieldy.

MR HOSKINS: Absolutely, I am in your hands, sir, obviously.

So, Mr Ramirez, just, again, to make I have understood your answer -- and I am sorry if this is dumbing down for the lawyers -- but I think it is fair to say from what you have just said that the choice of explanatory variables may affect the reliability of the model?

MR RAMIREZ: Of course, it -- in order to have a well specified model, you want to make sure that the right set of variables is reflected in that model, and as Professor Rime indicated and as put in my report -- in my first report, sir, we go through some of the explanatory variables that have been used in the literature to explain how half-spreads change, what are the factors that influence them. Of course, that serves as a basis for building the -- building the analysis in this matter.

MR HOSKINS: I am going to come on to those in a bit more detail, but first of all, I would like to look at the transcript of Professor Rime's teach-in, and we find at that {E/17/124}.

So you will be aware there was a teach-in last week and that Professor Rime took part in that teach-in, and this is a transcript of what he taught us. If you could go to line 11 on page 124, you see it begins:

"The study of dealers is very important ..."

If I could ask you to read to the end of that page and then read over the page {E/17/125} until line 7. So line 11 on this page to line 7 on the next page, please.

(Pause)

MR RAMIREZ: Yes, sir.

MR HOSKINS: So you will see that Professor Rime told us that:

"When it comes to information, again FX is somewhat different from other markets. The trading process in FX is what we call very opaque. The market has low transparency."

Do you agree, from your own knowledge, with the description of the FX market given by

Professor Rime?

MR RAMIREZ: Yes, it is opaque to some extent, yes, as Professor Rime is indicating.

MR HOSKINS: And given that the market is opaque, what challenges does that create for conducting a regression analysis?

MR RAMIREZ: Well, I think the opaqueness of the market, of course, reflects the regression analysis to the extent that there are some changes in how much information there is available in -- in the market. So, one thing that we do see is that, over time, spreads have somewhat narrowed, because, for instance, the rise of electronic trading has given, in extent, some degree of additional information on -- on pricing. So, I think that it is -- this is a variable that can affect spreads, but then, of course, it is reflected in -- in a number of potential explanatory variables.

MR HOSKINS: So, if the market is opaque and if there are a number of explanatory variables -- let me put it another way, a number of potential drivers of spreads, then is it fair to say that the fact the market is opaque makes it harder -- makes your job a bit harder in identifying which explanatory variables should be included in the model?

MR RAMIREZ: I do not necessarily think so, sir, because when we talk about things that affect spreads, they are somewhat related to factors that -- factors that relate to, say, for instance, the bank's operating costs, or their cost of accessing liquidity, characteristics of the customers that they are trading with, overall measures of market volatility, and so those are going to essentially affect the level of half-spread, irrespective of what the underlying degree of opaqueness is in the market, because that has a direct effect, of course, on the bank who is doing the trading.

MR HOSKINS: But when one comes to -- obviously there is a literature on the market, and we will come to that, but the point I am putting to you is this. In a market where the drivers of price, or in this case spreads, are opaque, it must, by definition, make it more challenging to identify the relevant explanatory variables than, for example, in a market which is transparent. It is just that simple point which I wish to put to you.

MR RAMIREZ: Well, I am not sure it is correct to say the explanatory variables are opaque, it is that the FX market can be opaque. But as I have just mentioned, the factors that affect the spreads are not necessarily related directly to that opaqueness, some may, some may not. But I would just reiterate that these factors and the opaqueness have been considered in the literature that models how spreads are -- how spreads change.

THE CHAIRMAN: Professor, I see you have got your hand up again. Do please add your contribution.

PROFESSOR RIME: Thank you.

So I think it is important to remember that we are modelling the decision-making of individuals in the market, and this opaqueness also influences the degree that they can observe things in the market. So, it is not like you can say that there are relevant stuff that they do not observe. They relate to the stuff that they can observe, and in the analysis we need to condition on that, and I would say that is exactly what we do. Again, this example of indirect harm here, adverse selection, that is a good example where we respect this. We relate and use observables that are available to the dealers in the interdealer market, preferably, not more, not less.

THE CHAIRMAN: Thank you, Professor.

Mr Hoskins, over to you.

MR HOSKINS: Thank you.

So Mr Ramirez, you drew a distinction between the drivers of the spread and then the explanatory variables which are included, and they are obviously distinct things. But the explanatory variables will be drawn from the pool of the drivers of the spread, will they not?

MR RAMIREZ: I do not see a distinction between those. It is essentially the explanatory variables which are having some influence on the spreads that are opaque.

Now, sometimes those may be difficult to measure and a proxy is required, that is true, but in general, we are talking about identifying the variables that do drive changes in spreads.

MR HOSKINS: In the answer before Professor Rime's response, you said that the explanatory variables would be drawn from the literature, so that is where you go to in terms of informing yourself about the industry and what explanatory variables might be included in your model; is that correct?

MR RAMIREZ: That is -- that is partially correct. The other -- the other source of information, of course, is market -- market research, what is -- what are the characteristics of the market, the UK market, is there a need to account for that in terms of on what platforms are transactions made, and who are the dealers that are participating in the -- in the market, and I think that we draw -- the Evans team draws from, of course, Professor Rime's knowledge of the theory and his model of the spreads, but of course, Richard Knight's experience as -- as working for FX too.

MR HOSKINS: Can we go to your first report. So this is {EV/10/51}.

If I could ask you just to refresh your memory of what you say at paragraph 112, please, and it goes over the page again, so you should ask to see the next page when you are ready {EV/10/52}.

(Pause)

MR RAMIREZ: Yes, sir.

MR HOSKINS: And you will see you have a footnote 170, {EV/10/52}, and that says:

"For a discussion regarding multiple model specifications, see, for example, D.L. Rubinfeld, 'Reference Guide on Multiple Regression' [and] 'Reference Manual on Scientific Evidence', The National Academies Press."

And that extract, that document is at {B/11.1/1}. Is that the document you refer to in your footnote?

MR RAMIREZ: Yes, sir.

MR HOSKINS: Can we go to page {B/11.1/311} -- I am sorry, in the electronic bundle it is page 2 -- sorry to the operator. {B/11.1/2}.

You will see the heading, "What model should be used to evaluate the question at issue"; do you see that by B?

MR RAMIREZ: Yes, sir.

MR HOSKINS: And it says:

"Model specification involves several steps, each of which is fundamental to the success of the research effort. Ideally, a multiple regression analysis builds on a theory that describes the variables to be included in the study. A typical regression model will include one or more dependent variables, each of which is believed to be causally related to a series of explanatory variables."

Presumably you agree with that description, do you?

MR RAMIREZ: Yes, sir.

MR HOSKINS: Then, on page {B/11.1/3}, you see the heading at the bottom of the page, "Choosing the dependent variable"? It is the paragraph above I want to refer you to:

"Failure to develop the proper theory, failure to choose the appropriate variables, or failure to choose the correct form of the model can substantially bias the statistical results -- that is, create a systematic tendency for an estimate of a model parameter to be too high or too low."

Again, can I check, do you agree with that?

MR RAMIREZ: Yes, sir.

MR HOSKINS: Then on page {B/11.1/5}, the second sentence on that page:

"Failure to include a major explanatory variable that is correlated with the variable of interest in a regression model may cause an included variable to be credited with an effect that actually is caused by the excluded variable. In general, omitted variables that are correlated with the dependent variable reduce the probative value of the regression analysis."

And then jumping to the final sentence:

"As a result, the omission of an important variable may lead to inferences made from regression analyses that do not assist the trier of fact."

Again, do you agree with that?

MR RAMIREZ: Yes, sir. We talked about this a little bit earlier in the context of omitted variables.

MR HOSKINS: I want to move on to a different topic. There is a dispute between you and Professor Rime on one hand, and Professors Breedon and Bernheim on the other in relation to the use of realised spreads in any econometric model, yes?

MR RAMIREZ: Yes, sir.

MR HOSKINS: Can we go -- I am just going to first of all set out, so we are all on the same page, what the definition of an effective half-spread and the definition of a realised spread measure is. I would like to take those definitions from Professor Breedon's first report. That is at {MOH-B/0/57}. You will see at paragraph 6.13(c), Professor Breedon says:

"The 'Effective Half Spread' -- measures the difference between the execution price of a buy or sell order and the 'Market-Mid-' ... at the time of a trade's execution."

Do you agree with that definition of the effective half-spread?

MR RAMIREZ: Yes, sir.

MR HOSKINS: And then if we can go to page {MOH-B/0/58}, so still in Professor Breedon's first report, at 6.18(a) you will see:

"The 'Realised Spread' -- measures the difference between the exchange rate paid for the trade ... and the prevailing market price for the opposite trade for the relevant instrument at a point in time shortly after the trade's execution ..."

Do you agree with that definition of the realised spread?

MR RAMIREZ: Yes, sir.

MR HOSKINS: So the difference in time between the effective half-spread measure and the realised spread measure is the time at which the measurement is made; is that correct?

MR RAMIREZ: Yes, sir. It is either at the time or slightly before or after.

MR HOSKINS: Can we go to your second report, that is {C/7/55}. So this is your second report, paragraph 138. If I pick it up in the -- sorry, do you have it?

MR RAMIREZ: Sir, I have it.

MR HOSKINS: So you will see the heading at the bottom of the page, "Conceptual concerns with Prof Breedon and Prof Bernheim's proposed use of realised spreads". I want to pick it up from the second sentence:

"However, as discussed in the supplemental report of Prof Rime, there are other factors that would have affected dealer earnings that are unrelated to the cartels, and hence the realised spread will not merely capture the proposed defendants' increased revenue from their anticompetitive conduct."

Do you remember that?

MR RAMIREZ: Yes.

MR HOSKINS: What is the problem for the model if there are factors, if there are other factors that would have affected dealer earnings that are unrelated to the cartels? What is the problem that you are identifying there?

MR RAMIREZ: Right, I think the distinction here, sir, is that there are -- as is discussed in Professor Rime's report, there are reasons for which the realised spread may not be a reliable measure of what Professor Breedon and Professor Bernheim intend to capture. From our perspective and for the perspective of my report, it is -- we are focused on the effective spread, because that is the price that is paid by the class member, that is the focus of our analysis. It is not focused on what the dealers' revenue is. Professor Rime, I think, in his report -- and Professor Rime, please correct me if I am incorrect -- is saying that there are factors other than the cartel that may influence those dealer earnings.

MR HOSKINS: What is the impact of that then in using a model that is based on the realised half-spread? What is the criticism you are making here of the Breedon and Bernheim approach?

MR RAMIREZ: Right, I think that it is -- the criticism is that they are capturing the dealers' revenue. That may be tainted by other effects, which were discussed in Professor Rime's report. From the perspective of my report, it is important that we are focused on what in particular we -- the price paid by the class member, which is the effective spread.

MR HOSKINS: Again, does the fact that the market is opaque -- I am sorry.

THE CHAIRMAN: No, no, Mr Hoskins, not at all.
Professor Rime has his hand up and probably -- we will hear from you, Professor, and then Mr Hoskins you can go on.

PROFESSOR RIME: Thank you.
So, we argued that the effective spread measured the cost to the customer in -- in the trade. While the definition of "realised spread" is that it subtracts a component, namely what they call the "adverse selection component" from the effective spread, from the perspective of the customer, this subtraction is not relevant, so including that in the estimation of the customers' cost makes potentially using the realised spread imprecise, because the way they say that they are going to use it, as I read it, realised spread may both be smaller than effective spread because of this subtraction, hence underestimates the cost to customers. It may also be larger than the effective spread when applied to the cases with front-running. Finally, they have raised that their measure is good because it captures reporting lags, and presumably, if you knew those reporting lags you would include them and then you would basically end up with a proxy for the effective spread.
So then you end up with three different cases, and

this would make estimation using the realised spread, to my view, imprecise.

MR HOSKINS: And Professor Rime, does the fact that the market is opaque create any additional difficulties for Professors Bernheim and Breedon?

THE CHAIRMAN: Professor, do go on.

PROFESSOR RIME: Yes, I am trying to think over --

THE CHAIRMAN: I am so sorry.

PROFESSOR RIME: -- the question.

To me, it boils down to whether it is possible to pinpoint this point in time after the customer trade for making the comparison with the transaction price, and then, do the opaqueness of the market make pinpointing how long after the customer trade you need to go in order to capture this front-running? Does it make it more or less or does it not influence this measurement?

MR HOSKINS: While you are thinking, can I show you your second report, which I think goes to the point you have just referred and that might help you in your thinking. So, if we can call up {C/6/70}. So this is your second report -- I am sorry, that is the wrong reference, so {C/6/70}, thank you. 70, sorry, it is the Scottish accent, 7-0.

Paragraph 163, you will see the heading, "An incorrect time window introduces more market noise into the calculation".

PROFESSOR RIME: Yes.

MR HOSKINS: You say:

"Selecting the appropriate time window is important to minimise the market noise that can affect post-trade price movements. Professor Breedon and Bernheim assume that prices will move in a certain way after Coordinated Price Manipulative Trading ceases (and indeed, even after a trade), but those assumptions may be false as there are other market developments (unrelated to the Coordinated Price Manipulative Trading) which could move the prices in different directions, and they have no means of identifying or controlling for these."

My question for you is: is the fact that the market is opaque part of the reason why you say they have no means of identifying or controlling for these?

PROFESSOR RIME: I am not sure, to be honest. I, again, am following the principle that you base it on the information available to the market participants. It could very well be that they would have the information available to try to condition for this, but it would be an extremely complicated process and trying to control for all the possible market events going on after the customer trade and before that reference point in time. I believe I wrote in my report that I would like, in order to do this properly, you need to identify each case of front-running to do this properly, and if you do not, then I would say it is impossible to identify all those possible market factors going on in between the customer transaction and the reference point in time afterwards.

MR HOSKINS: And why would you need to identify every instance of front-running?

PROFESSOR RIME: Because it would be a very complicated search procedure for finding this, and you would need that information in order to guide your search.

MR HOSKINS: And search for what? What are we searching for?

PROFESSOR RIME: For market events. That is why I am not sure it is really an issue about opaqueness, because those market events in between could, for example, be trading going on in the interdealer market, which is observable for the dealers in the interdealer market, but you have to sort of distinguish between market events then that are, as I explain it, not related to -- to this transaction and those that are new events, like that needs to be controlled for.

MR HOSKINS: So you are trying to -- one of the issues is, you are trying to distinguish between "normal market events" and events or effects that are due to the cartel?

PROFESSOR RIME: Yes.

MR HOSKINS: If you look at paragraph 164 of your second report, I just want to refresh your memory as to what you say there. So you refer to the fact that:

"... many trades are conducted every second, which makes isolating the post-trade movement that is associated with the price impact of a trade in normal market conditions difficult."

Again, I think you have probably answered this, but if you have got anything to add now, please do. The question is, why is the number of trades conducted every second relevant to constructing an econometric model?

PROFESSOR RIME: Those trades are, in the literature, regarded as information events. They occur, often believed to be a result of some behind information event. Why the transition from the customer transaction price, which is manipulated in the case of a front-run transaction, that transition back to its sort of reference level in order to measure the cost to the customer, that transition may be different from ordinary trading, which is, we believe, driven by information, and that transition may, in fact, also occur without any transactions at all during the transition phase, because we can think of this manipulative price as a bubble price which, in principle, can correct back to its ordinary level without any -- any trading, simply be corrected.

MR HOSKINS: Thank you.

Can I go back to Mr Ramirez for a moment, please. I just want to put some general propositions to you, very simple -- you are going to have to excuse the lawyer dumbing down again -- about using econometrics to calculate damages.

So the first general proposition is this. All else public equal, the more complex a model, the greater the risk that it will be unreliable. Do you accept that as a general proposition?

MR RAMIREZ: I do not necessarily think that is the case. The model can be complex and a -- can yield an unbiased and reliable version of estimate of the overcharge.

MR HOSKINS: That is why I used the phrase "all else being equal". I can understand might, on a good day, have a model which is very complex, but very reliable, but in general terms it is a very simple proposition. The more complexities you are having to deal with in a model, the more risk you have of it being unreliable; yes or no?

MR RAMIREZ: Yes, but I think it depends on the variables of interest and the extent to which those proxy some of the underlying complexities that you may have identified.

MR HOSKINS: That leads me on to my next question, or my next proposition, which is, all else being equal, the more proxies that you include in the model, the greater the risk that the model will be unreliable.

MR RAMIREZ: No, sir, I would not agree with that, the reason being is that, on the whole, it is preferable to include more explanatory variables than the flip side of having an omitted variable, and the including variables that are perhaps unnecessary to the model may affect the precision of the estimates, which would tell us how -- how much error was associated with our estimates, but it is not as consequential as omitting a relevant variable in the model.

MR HOSKINS: Sorry, it is my fault for not defining the question well enough. My distinction was not between a model with proxies and a model without proxies but omitting important explanatory variables. Assume a model that has all relevant explanatory variables in it. In one of the models, all the variables are taken from direct observations, from actual facts. In the other model, all of the observations rely on proxies. My general proposition is that the model with the proxies will be inherently likely to be more unreliable than the one that relies entirely on direct observations; do you agree?

MR RAMIREZ: Could you make a distinction between direct observations and proxies?

MR HOSKINS: Well, my understanding is that when you can directly measure a relevant factor, you will use that direct measurement in the model. However, when you cannot directly measure a relevant factor, that is when you turn to proxies. That is the distinction I draw between them.

MR RAMIREZ: That is true, although a lot of variables are essentially in themselves proxies for an underlying phenomenon. So in other words, how is volatility measured? There is a variety of ways to measure what volatility is. So, of course it is important to include variables in that are direct measures, but often times proxies are often necessary and they do not per se make a model any less reliable than one without proxies.

MR HOSKINS: But where you have a choice, assume you have a relevant explanatory variable, you can either model it using a direct measurement or you can use a proxy. As an economist, which would you generally prefer?

MR RAMIREZ: Direct measurement is preferable to the extent that the proxy is any less reliable. Of course, a proxy can often correlate with the underlying phenomenon that you are trying to measure perfectly well and be suitable and pick up that effect. So, it rather depends on how good the proxy is.

MR HOSKINS: Thank you.

Can we go to your first report {EV/10/51} and paragraph 112, please. You read this a little earlier, I showed it to you, and you refer to the need to have regard to the relevant FX literature to inform the choice of explanatory variables in this case, yes?

MR RAMIREZ: Yes, sir.

MR HOSKINS: And I have to confess, I have read more articles on FX microstructure than I would wish as a result of this case, but my sense from reading that literature is the literature in the area is still developing; would you agree with that?

MR RAMIREZ: Yes, there are new articles that come out consistently.

MR HOSKINS: There is no off-the-peg model in the literature for calculating the damages in this case?

MR RAMIREZ: That is correct, although, sir, I would say that is -- that is true of any case. I think what the literature helps us with is, of course, it offers some assistance as to how -- what factors have already been studied as those that influence half-spreads, how has that theory been developed and would those be potentially useful in our -- our model in this case to the extent we need it to measure the overcharge.

MR HOSKINS: So there is no off-the-peg model, you agree?

MR RAMIREZ: Absolutely correct, sir.

MR HOSKINS: And no model has yet been tested in the courts in the context of FX damages?

MR RAMIREZ: Well, sir, I do not know the status of the US proceedings, but of course, from the materials that we have reviewed, we have seen the modelling work that was done by the US experts in that -- in that case.

MR HOSKINS: Can I go to page 57 of this report, paragraph 119. {EV/10/57}. You say there -- I am sorry, I will let you catch up in the hard copy, if that is where you wish to see it. So {EV/10/57}, paragraph 119.

MR RAMIREZ: Yes, sir.

MR HOSKINS: You say:

"It may also be appropriate to include additional variables in the regression analysis to control for any abnormal events or trends not explained by other explanatory variables. For example, the beginning of the overall infringement period coincides with the Great Recession of December 2007 through June 2009 ..."

So you identify the Great Recession as a potential reason for introducing extra explanatory variables, yes?

MR RAMIREZ: Yes, potentially, sir.

MR HOSKINS: Potentially.

And then we go to your third report, please, that is5 {C/10/22}, at paragraph 52.

MR RAMIREZ: Yes, sir.

MR HOSKINS: And you say there:

"Relating these concepts back to the FX market, I noted in my first report that the explanatory variables I identified may not adequately control for abnormal events or trends that are not explained by other variables -- eg the Great Recession. For example, to the extent that spreads were widened during the Great Recession in an exaggerated way that was not fully accounted for by other explanatory variables (eg variables related to inventory risks), then including additional dummy variables within the dummy variable approach could potentially control for this factor."

I am just interested in your use of the word "potentially". Why do you say it could potentially control for this factor?

MR RAMIREZ: Well, sir, I think in general we should avoid making any a priori conclusions. Of course, this is all -- our analysis in these reports are all prospective to a certain extent, because we have not seen the underlying data from the proposed defendants or any of the other potential sources for the spreads. So, a typical -- a typical methodology to use is, as I mentioned here, if there is a phenomenon and it is unique and it may not be controlled for by the other variables in the -- in the model, then it may be necessary to control for it. So I used "potentially" of course because we have not seen the data, sir.

MR HOSKINS: And when you say that it is important not to make any a priori conclusions, that is not limited to the Great Recession, that is in relation to the whole of this case, is it not?

MR RAMIREZ: I think with respect to the econometric modelling, the overcharge, making conclusions about what precise variables are appropriate or that the variables that I have identified will certainly lead to a reliable approach to calculating the overcharge, get a reliable estimate of any overcharge to the class, then that is in fact correct.

MR HOSKINS: Can we go to -- back to your first report. That is {EV/10/51}.

THE CHAIRMAN: Mr Hoskins, while we are doing that, I am conscious of the time and I am not in any way criticising, this has been extremely interesting, but obviously Mr Jowell is going to need his time. How are you doing?

MR HOSKINS: This is my last topic and I am fully aware of --

THE CHAIRMAN: No, I know you are.

MR HOSKINS: -- of the time. I must confess, I did not notice exactly what time we started, but I think --

THE CHAIRMAN: No, you -- I think you started ten minutes later, but do carry on.

MR HOSKINS: This is my last topic, just to reassure everyone, and probably reassure Mr Ramirez as well.

Paragraph 112 -- again, we have seen this now a number of times -- and you say:

"[The] literature identifies three broad categories ... that determine half-spreads."

And the categories are: operating costs, inventory risk and customer-specific factors. Can you tell us why would -- why should an econometric model take account of operating costs? Why should those be accounted for in the explanatory variables?

MR RAMIREZ: Of course because the bank, of course, incurs certain costs in order to provide liquidity to the class, and costs can of course be related to the price that is being charged, and so in that instance, we want to get some assessment in the model of the costs that the market-makers incur, including in terms of their cost for providing FX services, their operating costs, and then as well as their cost to obtain funding. Things along those lines, sir.

MR HOSKINS: And inventory risk? Why do we want to take account of that in the model?

MR RAMIREZ: Of course, the extent to which it -- there is risk to holding on to inventory, the dealer is, of course, going to want to be compensated to a greater extent because they are holding a larger risk related to the inventory.

MR HOSKINS: And the third one, customer-specific factors? Why is it important to take account of those in a model?

MR RAMIREZ: Well, certainly. So, certain customers who trade more frequently may -- with market-makers, may obtain different pricing than those that do not. For instance, this was discussed in Mr Knight's report. So I think these three broad categories of factors are there to identify different variables that can affect the level of the half-spreads that the customers have paid, and so that is why those are presented in my report.

MR HOSKINS: And what would be the effect on the reliability of a model if it entirely excluded one of these broad categories?

MR RAMIREZ: Well, it -- it depends on the extent to which that -- they could potentially be proxied by other variables. In fact, I note in my report that some of the variables that I have identified -- these topics -- these categories, sir, to put it another way, are not mutually exclusive, so there can be variables that account for more than one -- more than one factor.

THE CHAIRMAN: Sorry, Professor, I see you have got your hand up and do supplement again Mr Ramirez's answer.

PROFESSOR RIME: Thank you.

So my comment was simply on this adding controls for special events and whether there were other special events than the Great Recession. I think it is fair to say that in the academic literature, the Great Recession stands out as a very special event and they typically, in the academic literature, treat that as a special event for control -- and (inaudible), but not necessarily other following. So we are not completely in the -- in the blue, we have economic theory and practice that guide us.

Thank you.

THE CHAIRMAN: Thank you, Professor.

MR HOSKINS: Mr Ramirez, you said that the three headings do not necessarily neatly fit in the model, but you might have proxies that would cover off these headings. So let me put the question another way. Assume you had a model that took no account of operating costs. What would be the effect on the reliability of that model?

MR RAMIREZ: Well, to the extent that it is not proxied by other variables in the model, it could relate to omitted variable bias, and then an unreliable model in the sense that some of the other coefficients -- some of the other variables in the model, to the extent that they are correlated with the variables that have been excluded, can show bias. So that can be -- that can be the effect.

MR HOSKINS: Presumably that is not specific to operating costs, the same would apply if there was no account taken of customer-specific factors, for example?

MR RAMIREZ: Well, sir, I think -- I think there it may depend. So, for example, on -- many of the electronic trades are done on anonymous platforms. So there, there is no customer information at all that is present in the -- the data, because both sides are anonymous. So, it is not necessarily the case that each of the variables would be -- are necessary or relevant when we are talking about modelling spreads overall, we would want to take into account factors.

MR HOSKINS: So what about a model which was seeking to identify the effect on spreads where we are not dealing with anonymised trading? Would you have to take account

of customer-specific factors?
MR RAMIREZ: Yes, that is -- that is correct.
MR HOSKINS: Can we go to --
THE CHAIRMAN: So sorry, I see Professor Rime has his hand up.
MR HOSKINS: So sorry.
THE CHAIRMAN: No, this is very difficult.
Professor.
PROFESSOR RIME: Thank you.
I would just like to comment on this with operating cost. So it is quite standard in the literature to identify the operating cost component of a bid-ask spread by the constant in their progression, and it is also the -- the constant is also typically capturing -- said to capture excess profits, and that is exactly the way that we do it when it comes to customer harm identified, we have dummies on -- on a constant term, so ...
Thank you.
MR HOSKINS: So Mr Ramirez, I am still in your first report. I am going to look at paragraph 116(a), which is on page 56 {EV/10/56}.
MR LOMAS: Mr Hoskins, I do not want to take you off but I have one more question on 112, will you be coming back to it?

MR HOSKINS: No.
MR LOMAS: Could I ask, Mr Ramirez, on those three factors, why is the concept of information asymmetry not in those three factors or do you think it is impacted in it somewhere? Because that seems to me to be relevant to spreads.
MR RAMIREZ: Yes, it is -- it is reflected in some of the variables that we -- that have been identified in the model. Information asymmetry can, of course, be related to which customers are transacting FX, and so part of that will be covered in the extent to which the -- in the customer-specific factors that I have identified.
MR LOMAS: Sorry to push that a bit further. If it is in customer-specific factors, as I understand it, your theory of harm is not customer-specific, it is about the fact that those participating in the cartel had an enhanced information position by comparison with others, and that was because of the communications between them not -- and it is not related to the particular counterparty in a given transaction, and what I was trying to get at is, is that effect captured in any way in those three criteria?
MR RAMIREZ: Well, I think, with respect to -- of course, the market can affect -- just because it affects all

customers, it does not mean that all customers are necessarily affected to the same extent. So, the extent to which customers explain some of the changes in half-spreads, those -- those factors should be included. I do not see it necessarily tied to the precise theory of harm, although perhaps Dagfinn can provide his input.

THE CHAIRMAN: Yes, Professor.

PROFESSOR RIME: Thank you.

So this part relates to the direct harm, as we call it, the harm to the customers of the -- of the defendant banks. In that setting, customer-specific factors probably captures the extent that some customers might be regarded as informative. So, remember in my teach-in I talked about the information environment as being dispersed and that lots of market participants have each their sort of piece of the total picture, and these customer-specific factors are thought in the literature to capture the extent that different types of customers may bring such information to the dealers. That influences the pricing of the dealers in that direct -- in that direct harm part.

Then, the next step is utilising that information that the dealers gain from trading with their customers in interdealer trading, and that is the indirect harm analysed with -- for adverse selection. Then typically, so, the dealers turn around and use the fact that the customer that they believe to be informed now is buying, and our theory is that they share this with other dealers in the cartel and they all trade on this in a concerted way, possibly tacitly, or in the interdealer market, and that gives rise to adverse selection.

MR LOMAS: Thank you.

PROFESSOR RIME: Thank you.

THE CHAIRMAN: Mr Hoskins. You are muted.

MR HOSKINS: I am too efficient for my own good sometimes!

{EV/10/56}, please. Sorry, I am looking for paragraph 116(a). Here it comes.

THE CHAIRMAN: There we are.

MR HOSKINS: So, this is where in your first report you go through the three categories and you identify potential explanatory variables relating to each category, yes?

MR RAMIREZ: Yes, sir.

MR HOSKINS: And at 116(a) you have the heading:

"Customer Trading Activity -- Customers who trade more frequently incur more trading costs and therefore generate more profit opportunities for the dealer."

And then you can read what you say there about customer trading activity and why it is relevant to the model. And you say, in the final sentence:

"Trading activity can be computed from the proposed defendants' transaction data."

Yes?

MR RAMIREZ: Yes, sir.

MR HOSKINS: And then the second potential explanatory variable in relation to customer-specific factors you identify is at 116(b), which is:

"Sophistication ..."

And again, I would just invite you to refresh your memory about what you say about why that might be a relevant variable.

(Pause)

MR RAMIREZ: Yes, sir.

MR HOSKINS: In the penultimate sentence of 116(b), {EV/10/57}, again you make the point -- the data point:

"These variables may be constructed from the proposed defendants' transaction data given that, in Mr Knight's experience, the method of execution is recorded by the proposed defendants."

So the intention for both these potential explanatory variables is to draw on the data that you hope will be disclosed by the defendants, yes?

MR RAMIREZ: Yes, sir, those are the most direct ways that we may be able to measure it using the defendant data.

MR HOSKINS: Can we go to page 5 of this report, {EV/10/5},

please. You split the class members into class A and class B, yes?
MR RAMIREZ: Yes.
MR HOSKINS: And class A covers transactions with the proposed defendants, yes?
MR RAMIREZ: I am sorry, sir, slightly.
MR HOSKINS: I am going to come to -- I know what you are going to say.
MR RAMIREZ: Okay. I will let you continue, sorry to break --
MR HOSKINS: Let us see if I have read your mind and vice versa.
And class B includes -- it is not the whole class, but class B includes banks that were not addressees of the EC decision and also includes addressee banks for periods when they were not in the cartel, yes?
MR RAMIREZ: Yes.
MR HOSKINS: Is that the point, good?
MR RAMIREZ: Yes, that is the -- the last part there was just that I was going to point out that there are some transactions with the proposed defendants that are in class B.
MR HOSKINS: So I am going on to focus for this purpose on the part of class B that includes banks that were not addressees of the EC decision. I appreciate it is wider

than that, yes?

Can we go to {EV/10/45} of this report, and your table 6 is a "summary of volume of commerce across class A and B".

MR RAMIREZ: Sir, I am terribly sorry. You said page 45?

MR HOSKINS: Page 45, yes.

MR RAMIREZ: Of?

MR HOSKINS: Of still the same report, so {EV/10/45}.

MR RAMIREZ: Okay.

MR HOSKINS: And you will see your table, and you will see the totals, Class A, 41 million, Class B, 74 million, and then a total. So, again, a simple point, class B is a substantial part of the proposed claim, is it not?

MR RAMIREZ: That is right. If you consider the two classes together, then with respect to VoC, class B is, I would say, almost two-thirds there, 60% or so.

MR HOSKINS: Then page 64 of this report {EV/10/64}. So you see the heading. Then at 136:

"For those transactions made by members of class B with RFIs during the overall infringement period, I can utilise data from one or more MBPs and/or settlement data from CLS to jointly estimate the overcharge attributable to less competitive market conditions and increased adverse selection costs."

So in this subsection of your report you are explaining how you will calculate the loss suffered by class members who traded with banks who were not in the cartel; correct?

MR RAMIREZ: Yes, sir.

MR HOSKINS: And you explain you intend to rely on data from MBPs, which are multi-bank platforms, and/or settlement data from CLS, which is CLS Bank International, which is an organisation that compiles relevant data on the settlement of FX transactions; is that correct?

MR RAMIREZ: Yes.

MR HOSKINS: And then on page {EV/10/67}, paragraph 141, you say:

"The anonymised nature of MBP and CLS data precludes the inclusion of customer-related explanatory variables."

Do you see that?

MR RAMIREZ: Yes.

MR HOSKINS: So that means that your model -- your proposed model for this part of class B will not include any explanatory variables for customer-specific factors; that's correct, is it not?

MR RAMIREZ: Yes. However, I would say that with respect to data sources that I have identified, two of those are anonymous, so no customer information has really been present or persistent in the market.

MR HOSKINS: But that is a problem with the data you have, because you accepted a few minutes ago that when you are dealing with trades -- with trades which are not anonymised, then you do need to take account of the customer-specific factors in the model. You said that about ten minutes ago to me.

MR RAMIREZ: Yes, sir.

MR HOSKINS: These category of trades are not anonymised.

MR RAMIREZ: These categories of trades, the trades with the -- with the RFIs?

MR HOSKINS: Correct. You do not have the data, but the trades themselves are not anonymised, it is a dealer dealing with a counterparty, just as in Class A.

MR RAMIREZ: Sir, I need to disagree with you to an extent there, because a certain portion of both class A and class B's transactions are conducted on anonymous platforms. So -- and what is said 16% of VoC is class members who are participating on anonymised platforms, and the same holds true, there is another portion that -- where customers trade on anonymised platforms outside of interdealer markets, so for instance, HotSpot is -- is also an anonymised source.

MR HOSKINS: Yes, but a large part, the majority, of the class B trade with non-cartel banks is not anonymised, do you accept that, by definition, from what you have just said, yes?

MR RAMIREZ: Of course.

MR HOSKINS: And you can see from paragraph 141 that your proposed model therefore takes no account of customer-related explanatory variables; correct?

MR RAMIREZ: Those are not listed here on the basis of the data that we intend to use, that is correct.

MR HOSKINS: Sir, I am sorry to you, and I am sorry particularly to Mr Jowell for having outstayed my welcome a bit, but I have no further questions. Thank you very much to the witnesses for their time.

NEW SPEAKER: I see Professor Rime has his hand up.

THE CHAIRMAN: He does.

Professor Rime.

PROFESSOR RIME: Thank you, I will be very brief.

It is common -- normal to believe that it is the most sophisticated customers that trade on multi-bank platforms and they typically receive tighter spreads. So if we were only to look at multi-bank platforms then probably we would make -- we would err on the lower side, we would estimate possibly too low customer transaction costs.

Thank you.

THE CHAIRMAN: Thank you, Professor.

Mr Hoskins, anything out of that? No.

Well, thank you very much, Mr Hoskins, and thank you to the witnesses. What we are going to do is we are going to rise for a couple of minutes, until 12.10, just so that we can stretch our legs.

Mr Jowell, you will have an hour, we will run into the short adjournment so that there is position and time for re-examination, so we will run to about 1.30, and if I can suggest that everyone is, as it were, on their buttons ready for a hot start at 2 o'clock rather than -- so if you can assemble at 5 to, we will try and shave a few minutes off, because I imagine this afternoon's session will be as full as this morning's.

So let us resume at 12.10 when, Mr Jowell, you will do the questioning.

MR JOWELL: Thank you.

THE CHAIRMAN: Thank you.

Thank you very much.

(12.07 pm)

(A short break)

(12.13 pm)

THE CHAIRMAN: Well, welcome back. Without further ado, Mr Jowell, I will hand over to you.

MR JOWELL: Thank you, sir.

Cross-examination by MR JOWELL

I would like to start, if I may, by asking a few questions of Professor Rime on this occasion. I would like to start with a few points that I think will be uncontroversial. Now, you identify in your reports a distinction that you say there is between mechanisms of what you call "direct harm" and a mechanism of what you call "indirect harm". You will recall that distinction in your reports, I am sure?

PROFESSOR RIME: Yes.

MR JOWELL: And you recognise that one of what you call the indirect effects of the cartel would be adverse selection risk, which you describe as "the risk of trading with a better informed counterparty", and you say that that adverse selection risk would apply to, in particular, you say, to transactions with FX dealers who are not in the cartel; that's correct? So your class B.

PROFESSOR RIME: Yes.

MR JOWELL: You consider that that adverse selection risk would or could cause those non-cartelist dealers to widen their spreads on the interdealer market; that's correct?

PROFESSOR RIME: Yes.

MR JOWELL: We heard yesterday that your position is that adverse selection risk arises from -- we heard it actually from Ms Wakefield, one of your barristers -- she said that adverse selection risk arises from essentially all of the types of information exchange that are identified by the European Commission; that's correct? You agree with that too, I take it?

PROFESSOR RIME: No.

MR JOWELL: No, ah.

PROFESSOR RIME: I would say that adverse selection risk primarily arises from -- what is the exact wording of the decisions? It is a customer's position taking trades. I need to find the exact wording, but --

MR JOWELL: What one might call collusive front-running, is that ...?

PROFESSOR RIME: No.

MR JOWELL: No, I see.

PROFESSOR RIME: No. On the contrary, I would say that collusive front-running do not give rise to adverse selection. The reason is -- and this is very important to understand adverse selection -- is that adverse selection happens because of a persistent impact on prices. So, the dealer that, for example, are selling, providing liquidity at the ask, and then prices persistently increase following this event, he will experience a loss, because he was selling low and then -- selling at one level and then later on it is persistently higher.

This type of movement is typically followed from --

from customers' position-taking, so that has a persistent impact on prices while collusive front-running has a temporary impact on prices, so there is not -- there is not adverse selection coming from that.

Furthermore, dealers in the interdealer market, the market segment where adverse selection occurs, they will typically be providing liquidity during the run up -- front running phase. So they will be gaining in this --

MR JOWELL: -- (overspeaking) --

PROFESSOR RIME: -- hence they are not experiencing this adverse selection.

MR JOWELL: Professor, forgive me, because I think that is very interesting, but I just want to establish then what is the part of the information exchanges that does give rise to the adverse selection on your case? Because your advocate said yesterday -- she said:

"Our case is that adverse selection risk arises as a consequence of all the unlawful information exchanges and not just the bid-ask spread information exchange."

Now, if that is not correct, obviously it is very important that the Tribunal is apprised of what is the information exchange -- what elements do give rise to adverse selection on your case. So we have established that, on your case, collusive front-running does not, so I am trying to now establish what, on your case, does give rise to the adverse selection risk --

PROFESSOR RIME: So -- so for example, information sharing on bid-ask spreads --

MR JOWELL: Yes.

PROFESSOR RIME: -- does not give rise to adverse selection.

MR JOWELL: So that also does not, okay. So what does?

PROFESSOR RIME: So for example, take recital 54, that mentions "immediate customer orders".

MR JOWELL: Yes.

PROFESSOR RIME: So, I would say, in particular, that source -- that will be the most important source for giving rise to adverse selection --

MR JOWELL: -- (overspeaking) --

PROFESSOR RIME: -- (overspeaking) --

MR JOWELL: Okay, so I am just trying to establish what they are. So immediate orders, conditional orders, I take it as well?

PROFESSOR RIME: No.

MR JOWELL: No? Okay.

Benchmark orders?

PROFESSOR RIME: No.

MR JOWELL: No, okay. So it is the exchanges on customer condition -- on customer immediate orders and that alone

is the only part that gives rise to adverse selection on your case? Then we need to correct what your advocate said yesterday; is that correct?
PROFESSOR RIME: I would say so, that it is in --
MR JOWELL: -- (overspeaking) --
PROFESSOR RIME: -- it is in recital 54, listed in the first sentence, and ... yes.
MR JOWELL: Right, okay.
Now, let us talk about that, the adverse selection risk, that arises, on your case, only from those immediate orders.
Now, could I ask that you be shown your second report, paragraph 55, which we find in the bundle {C/6/26}, please.
PROFESSOR RIME: Will it be shown? Thank you.
MR JOWELL: Yes.
We see here -- we see here:
"... the FX dealers who did not participate in the Cartels would respond to the increase in adverse selection risk and reduction in competition caused by the Cartels by widening their spreads."
Yes? So that -- and now you have clarified that that is -- that arises from the exchanges on the immediate orders alone, yes?
PROFESSOR RIME: No.

MR JOWELL: No, ah.
PROFESSOR RIME: There are two parts to that.
MR JOWELL: Okay.
PROFESSOR RIME: As there are two parts to the indirect harm.
MR JOWELL: Okay, but the adverse selection -- I just want to identify, the adverse selection risk there we have now established arises from the exchanges on immediate orders, on your case.
PROFESSOR RIME: Yes.
MR JOWELL: Yes, okay.
Now, there is another point that I would like to ask you about, and could I show you that. That is also in your second report {C/6/12}, please. Yes? We see here 17(b) and you see --
PROFESSOR RIME: 17?
MR JOWELL: 17(b)(v), just above the middle of the page, do you see? It is the paragraph that is --
PROFESSOR RIME: Oh, B, yes, yes.
MR JOWELL: Let me just read it to you. You say there:
"The joint CPO Response is incorrect to state that the information advantage obtained by the Cartels means that they would necessarily tighten their spreads. Rather, the increased adverse selection costs faced by other FX dealers would reduce the competitive

constraints on the dealers with the information advantage, which would enable the members of the Cartels to widen their spreads and profit from their participation in the Cartels."

Now, you return to that same theme later in your report. Let me show it to you again. It is {C/6/20}, if we could have that up. Thank you very much.

You see paragraph 37(c), you say something very similar there. You say:

"The joint CPO Response is incorrect to state that the information advantage obtained by the Cartels means that they would necessarily tighten their spreads."

And this is the critical bit:

"Rather, the increased adverse selection costs faced by the other FX dealers would reduce the competitive constraints on the dealers with the information advantage, which would enable the members of the Cartels to widen their spreads and profit from their participation in the Cartels."

Yes?

So, in summary, what you are describing in those passages, as I understand it -- and correct me if I am wrong -- is a mechanism whereby the adverse selection risk that has caused the non-defendant dealers to widen their spreads, in turn, feeds back to either permit or reinforce or encourage spread widening rather than spread tightening by the defendant cartelist dealers; that's correct?

PROFESSOR RIME: So, this is a byproduct of their interdealer speculation based on their information advantage.

MR JOWELL: A byproduct. But it has also caused -- it is something whereby the adverse selection risk that has caused the non-defendant dealers to widen their spreads feeds back to permit or encourage or reinforce the widening rather than the tightening of the defendant dealers' spreads; correct? Is that a fair summary?

PROFESSOR RIME: The "feedback" word --

MR JOWELL: Yes.

PROFESSOR RIME: -- gives the connotation to me that that is the direct harm, but I would argue that it is a byproduct and that makes --

MR JOWELL: -- (overspeaking) --

PROFESSOR RIME: -- it slightly different because the interdealer -- the market is a two tier market and speculation based on whatever information you have in the interdealer market is a core business of dealers being part of a cartel or not. This activity is something that they are doing because of the speculative gains that they can have. So they have a separate incentive for doing that.

If the incentive for doing it is to enable higher spreads to their own customers, I doubt that. I believe it is the speculative gains that is the primary motive for this, not the ability to have this feedback, as you put it.

MR JOWELL: That may be, but you are still -- you say here in your report twice, as we have seen, that the effect of the adverse selection which enables the non-cartelist dealers to -- not enables, tends to make them widen their spreads, reduces the competitive constraints on the dealers with the information advantage, and you say, "which would enable" --

PROFESSOR RIME: Yes.

MR JOWELL: -- which would enable the members of the cartels to widen their spreads.

So it looks as though you are talking here -- clearly talking about another causal mechanism by which the members of the cartel are enabled, or at least assisted, in widening their spreads. That is correct? That is what you have written?

PROFESSOR RIME: Yes.

MR JOWELL: Yes?

And so my question for you is, this additional mechanism, whether we call it "feedback" or "byproduct", is that a direct effect or an indirect effect?

PROFESSOR RIME: I would say it is an -- this is, in some sense, playing with words. I would say it is an indirect effect, because it is not -- and that is why I like the "byproduct" label better, because this part is not a direct decision of the dealer. So the two direct decisions the dealers are making is their customer spreads and their speculative decisions in the interdealer market, and the speculative decisions have indirect effects.

MR JOWELL: Well, you say it is an indirect effect, but it is an effect that is operating on the defendant dealers. It is manifesting in the spreads --

PROFESSOR RIME: Yes.

MR JOWELL: -- of the defendant dealers because it is enabling them. Yes? Do you agree?

PROFESSOR RIME: Yes.

MR JOWELL: Right.

So then, effects on the defendant dealers include indirect effects, logically?

PROFESSOR RIME: Yes.

MR JOWELL: Thank you, okay.

Now, could I ask you about something else, please.

MR LOMAS: Mr Jowell, before you move on, I just have one question for Professor Rime just to clarify understanding. When you say a persistent price increase, what exactly do you mean? Do you mean a price increase that goes beyond the specific transaction? How long is "persistent" when you use that term? I was slightly confused.

PROFESSOR RIME: So, with -- thank you. So, with "persistent", I basically mean a permanent one.

MR LOMAS: Sorry, a permanent one?

PROFESSOR RIME: Permanent one, yes. So it goes from one level to another level, and this is -- by this I mean a persistent impact on the price level, not the bid-ask spread, and this is how asset prices, which foreign exchange rate are part of, basically work. They have persistent or permanent jumps when they incorporate new relevant information, while at high frequency there might be temporary movements in prices, and distinguishing between temporary movements and persistent movements is important for identifying adverse selection.

MR LOMAS: Okay, I think that is a big topic, I will not go into it further because it will take Mr Jowell's time. Thank you.

MR JOWELL: Thank you.

Could we go to your second report at {C/6/14}, please, as we will see -- you see 19(c):

"The effects of the conduct identified in the Decisions would likely have 'spilled over' into other areas of the FX market including ..."

And if we could see over the page, please {C/6/15}:

"... electronic platforms due to the impact on spreads in the interdealer market and the principle of equilibrium. Therefore, while the Decisions' findings did not include conduct with respect to algorithmic trading, the effects of the Cartels' conduct included these trades."

Yes?

Now, included in the class A of the Evans class are trades in e-commerce in algorithmic trading, and that is the case even though it is what you called a "spill over effect" caused by the principle of equilibrium and by the interdealer market. So again, my question for you is this: is that a direct effect or an indirect effect, on your (inaudible)?

PROFESSOR RIME: I would label it as a direct effect because it is within the reach of that dealer unit, broadly defined, to determine the algorithmic -- the algorithms that decides on how the pricing should be at those electronic platforms that are within the control directly of the dealer.

MR JOWELL: Okay, so that one you say is direct, but the effect is not coming directly from the cartel is it? It is coming indirectly via the effect on the spreads on other trades?

PROFESSOR RIME: No, I must say I disagree again. Within the bank, they are -- have the freedom to determine their algorithms themselves. So this comes from the decision-making and I would say that is a direct decision of -- of them. So, yes, the adverse selection occurring in the interdealer market would be moving spreads at e-commerce as well, because, as I argue, and Mr Knight supports it, that would be an important input to the pricing on the bank's own e-commerce.

But in addition, they might -- and they do so, I have been told -- set parameters in this pricing that deviates from simply that, and that might be related to their voice trading, so which -- which is completely within their direct control.

MR JOWELL: So, you say this is something that is direct because it is within their control? Is that now how you are defining "direct", as something that is within their control? I mean, is not this all really just that you are describing a number of mechanisms, they are all interrelated and they are all liable to widen the effective spread? That is the reality here.

PROFESSOR RIME: The reality is that these are related, true, because these markets are in an equilibrium. That does not mean, or it does not follow that the impacts are the same.

MR JOWELL: No, it does not follow that the impacts are the same, but when you measure -- when, for example, you measure the effective spread, you are not going to be able to disaggregate. You say -- look at the cartelists, right, and you look at their effective spread. You are not going to be able to disaggregate that bit that relates to adverse selection and that bit that, coming from the non-defendant dealers and, as I would put it, feeding back, and that bit that comes from their original collusive conduct. You are just going to look at all of these effects, the direct effects and the indirect effects combined, loaded, and then you are going to measure them in the effective spread; correct?

PROFESSOR RIME: I would say that we follow the decision-making of the participants we study. So when we study the dealers in their role vis-á-vis their own customers, we study the information they condition on for the pricing. So that would include operating costs and customer characteristics. When we study the determination of adverse selection, we turn to a different subset of the market, the interdealer market, and analyse that in isolation, because these are different parts of the markets and there are different decisions being made, conditioned on different types of information.

MR JOWELL: Very well.

Before I get -- I am going to move on to another topic, but could I just you one point, Professor Rime, before I move on, about a different area, which is conditional orders or resting orders. In your report you note that customers with conditional orders sometimes gain the spread, yes? But I want you now to consider that subset of customers who place conditional orders with dealers direct, and I stress with dealers rather than on the interdealer market, as it were, yes?

PROFESSOR RIME: Yes.

MR JOWELL: Those customers typically pay the spread on conditional orders, do they not -- and I say typically?

PROFESSOR RIME: So that depends on the type of conditional order. So, for -- take profit type conditional orders. It is my impression, both from the literature and from Mr Knight's report, that those customers placing such orders are gaining the spread, while those customers that place a stop loss order are paying the spread.

MR JOWELL: Even when -- even -- take profit. Even when they are placed with dealers not on the interdealer

market? Is that your understanding?
PROFESSOR RIME: So that is -- that is my understanding. When such orders are placed in the interdealer market, they will be placed as a limit order, so then it is definitely an order that is gaining the spread. But then it is the dealers themselves that typically will be placing these orders.
MR JOWELL: Ah, okay, so that is -- I see, well, that is a very important qualification. So it is typically the dealers themselves that will be placing those orders.
PROFESSOR RIME: Because the interdealer market is primarily a venue for trading between dealers.
MR JOWELL: Yes, yes. But I am not interested in that market for these purposes, I am talking about the customer to dealer market, and my -- and what I suggest to you and to Mr Knight, who I see has got his hand up, is that, in those circumstances, the customers typically pay the spread and that is the correct, accurate, honest answer to the question.
Is it, Mr Knight?
THE CHAIRMAN: You are muted.
MR JOWELL: We cannot hear you.
MR KNIGHT: Sorry, can you hear me now?
MR JOWELL: Yes.

MR KNIGHT: I would have to disagree, because we have to look at the two tier market again. When a client will move a take profit order, he will be referencing it against a rate at which he is expecting to trade. Now, that reference rate, for transparency so that no manipulation can take place on behalf of the bank, will be the interbank market --

MR JOWELL: Forgive me, I am not asking about the interbank market. I made that very clear several times. I am not asking about the interbank market. I am asking about when a customer places with a dealer, not on the interbank market, and I suggested, in those circumstances, the correct answer is he pays the spread.

MR KNIGHT: No, because the dealer will place his interest into the market on his behalf.

MR JOWELL: Oh, I see. But then it is not truly with the dealer, then it is on the interdealer market.

MR KNIGHT: That is right. So a client, when they leave an order with a bank, will be expecting the bank to exercise in the best interest of the client. So for example, if they leave an order to buy at 100 and the market rate is falling down from, say, 105 to 110, when you get down to 100, the client's bid, which he has expressed via the bank to the market, is the best bid in the market. So the price cannot theoretically fall below the client's bid interest without the client's bid having been filled.

MR JOWELL: So your suggestion is that the dealers do these trades for the customers for free; is that right? They do not ...

MR KNIGHT: When you say "free", quite a lot of the time, yes, there is no transactional profit in it, but the information that is gained from those orders is considered as value.

MR JOWELL: Well, we will have to disagree about that, Mr Knight, but let me go on.

I would like to turn next to Mr Ramirez, if I may, and again, if I can start with something uncontroversial. Under the methodology that you propose, you intend to seek to exclude these conditional orders, sometimes called "resting" -- or typically called "resting" or "limit orders". Have I got that correct?

We cannot hear you, Mr Ramirez.

MR RAMIREZ: I am terribly sorry.

Yes, sir, we would attempt to exclude them from the analysis.

MR JOWELL: Now, in order to try and exclude these conditional orders or resting orders, you have suggested in your reports that you will seek to identify them in the data from other executed trades and then extract them from the data. Do you recall that?

MR RAMIREZ: I am sorry, sir, could you please repeat that?

MR JOWELL: I said that in order to exclude the conditional orders, you have suggested in your reports that you will seek to identify them in the data from other executed trades and then extract them from the data; that's correct? That is what you suggested, is it not?

MR RAMIREZ: I do not -- I do not quite appreciate what you are saying about other executed transactions. Just to broadly give an indication is that to the extent that these conditional orders are identified in the defendant's data, they will be identified with that information and then removed from the analysis. Then, I think my report sets out that, to the extent those are not identified, we could at least estimate what the volumes are and do an adjustment to the aggregate damage calculations.

MR JOWELL: Yes, and we will come on to that. I think that is your -- but that is your back up, I think, is the adjustment. Initially, you said: we want to exclude them, we want to find them and exclude them, yes?

MR RAMIREZ: Yes, to the extent it is feasible.

MR JOWELL: Okay, and that is what I would like to discuss with you, if I may, the extent to which it is feasible.

Because if we go to the respondents, what they say about this -- could I just show you that? It is in {AB/5/26}. Shall I say that again, could we please -- there we go, fantastic.

You see in paragraph 63, it says:

"Mr Evans proposes to exclude benchmark ... limit orders and resting order ... as was found in the US certification ruling, and contrary to Professor Rime's assumption, the Respondents do not hold data which enables these transactions to be reliably identified."

And they quote from the judge's decision in the United States.

Now, you are aware that that is the defendants' position in the United States and has been found by the judge in the United States, Mr Ramirez, yes?

MR RAMIREZ: I am not familiar with the particulars of what has gone on in the US proceedings. I know that there is an issue about identifying them --

MR JOWELL: Okay.

MR RAMIREZ: -- and I know that these proceedings, the defendants, of course, have said this in their response --

MR JOWELL: You are aware of that -- okay.

MR RAMIREZ: Yes.

MR JOWELL: You are aware there is an issue.

I want to go to your second report where you talk about this, so let us look at {C/7/21}, please, where we see paragraph 52 of your report. We see in this paragraph that you rely on two specific things. First of all, there is some evidence from Mr Knight, you say, that you rely on. You say:

"Mr Knight further notes that executed resting orders would also be identifiable in FX dealers' client management systems."

And then secondly, you talk about some information from an article -- an academic article published in 2003, yes?

MR RAMIREZ: Yes.

MR JOWELL: Now, we will come back to the article, but I would like to have a look at, if I may, at Mr Knight's report. Let us bring in Mr Knight, if I may. So this is {C/5/10}, please, and we see paragraph 30 of your report.

Now, before I come to this paragraph, can I confirm one thing with you, Mr Knight, and just so you understand, this is not a criticism at all, but my understanding is that you have worked all your life in sales roles, you have never actually traded, have you?

MR KNIGHT: Correct.

MR JOWELL: Thank you.

MR KNIGHT: I have sat next door -- next to traders in dealing rooms for 25 years.

MR JOWELL: But you have never actually traded yourself?

MR KNIGHT: No, not on behalf of the Bank.

MR JOWELL: And what we see in this passage is you start off and say:

"When an FX dealer receives a resting order from a customer, the order is entered by the salesperson or the trader into the electronic order book along with the conditions agreed with the customer for its execution. Entry of the order into the order book allows the traders and sales persons to record, monitor and manage the orders which customers have placed."

Yes?

MR KNIGHT: Correct.

MR JOWELL: So, as the salesperson, you would have had personal experience of having had such an order book which records the order, I take it?

MR KNIGHT: Yes.

MR JOWELL: In that order book, you say, you used to record -- or do record that the order is a resting order, yes?

MR KNIGHT: Well, to go into the order book it has to be a resting order for it to rest within it.

MR JOWELL: Yes -- well, yes.

But there is a difference, isn't there, between the order book data and then the recorded data on actual executed trades that the dealer has; correct?

MR KNIGHT: The dealer will have access to the order book themselves, but yes, any order that has not been executed or cancelled before execution will occur -- will appear in the order book, but will not appear in the transaction data.

MR JOWELL: Yes, so there is two different things: order book, transaction data --

MR KNIGHT: Yes.

MR JOWELL: Right? Okay.

You recognise that in the next paragraph. Can we go over the page, please, {C/5/11}, and we see you say there:

"Resting orders that were filled and so became transactions would also be recorded in the FX dealer's client management system."

Yes?

MR KNIGHT: Correct.

MR JOWELL: And you assert:

"Detailed information on customer trades, including the type of trades ... is considered valuable information ..."

Yes?

MR KNIGHT: Correct.

MR JOWELL: So it is valuable information.

But what you do not say, and quite rightly, is that the fact that the order was originally a resting order is recorded necessarily in the dealer's system where he records the executed trades. You do not say that in that paragraph and that is because it is not, is it?

MR KNIGHT: Are we talking about the transaction data on the dealer's side or the client management system --

MR JOWELL: On the dealer's side, that does not -- (overspeaking) -- does not record that it is a resting order, does it?

MR KNIGHT: That is correct, however it will be present in other systems.

MR JOWELL: It will be present in the order book, but then you have to match the two, do you not?

MR KNIGHT: It will also be present in the client management system.

MR JOWELL: Oh, is this a third system you say exists?

MR KNIGHT: Yes, it is.

MR JOWELL: I see. But the client management system you then have to match to the order book?

MR KNIGHT: For the transaction.

MR JOWELL: In order to the actual -- to the actually -- the actual executed transactions. You have to join the dots. You have to join the dots in the data, because there are thousands of these transactions going on every day, right? Sometimes --

MR KNIGHT: Yes.

MR JOWELL: -- (inaudible) -- yes? So, you do not know whether something that is actually in the executed data is going to correlate to a resting order -- whether it originated as a resting order?

MR KNIGHT: Unless you linked back the transaction and found that transaction within the client management system, at which point it would be identified as a resting order or not.

MR JOWELL: You do not know whether that can be done, whether it is possible to join the dots.

MR KNIGHT: Well, from experience, all client deals would end up in the client information system, client management system.

MR JOWELL: Yes, but then you cannot necessarily correlate them to the executed trades. You do not know whether you can do that or not, do you? You have never tried to do that.

MR KNIGHT: I have not tried to, but if every trade exists in the trade book and every trade exists in the client management system, they should be matchable.

MR JOWELL: Not necessarily, because there will be many trades a second, Mr Knight.

MR KNIGHT: But if each trade per second appears in both systems, they would be matchable.

MR JOWELL: You would think -- you might think that, but that is not actually the case, Mr Knight.

Now, if we go back to your second report, Mr Ramirez -- can we go back to that again {C/7/21}.

MR RAMIREZ: Yes.

MR JOWELL: Now, I think the other way that you dispute the notion that resting orders can be identified is by reference to an article in the Journal of Finance, by Ms Osler from 2003.

MR ROBERTSON: I hate to interrupt, but Professor Rime has his hand up.

THE CHAIRMAN: Oh, I am so sorry, I missed that. Thank you, Mr Robertson.

PROFESSOR RIME: Thank you.

So it is true that it is high intensity in FX, but that is in the aggregate across all participants. So within a bank, it is not necessarily so that it is multiple transactions within every second that would be in the aggregate market. In any case, you would match it using computer algorithms.

MR JOWELL: Okay.

Professor Rime, then let me put to you this question: hand on heart, can you be entirely certain that you can match the data from the client management system resting orders with the actual ex -- data on the actual executed trade? Hand on heart, can you be certain of that?

PROFESSOR RIME: Certain, no. I would believe I could do it, but certain, that is a big word in social science, so no.

MR JOWELL: No.

Well, I suggest that you may be mistaken about your belief, Professor Rime. You have never actually done it, have you?

PROFESSOR RIME: No, I have not.

MR JOWELL: Thank you.

Now, Ms Osler, she seems to have tried something similar, but she did it on a very small sample size, did she not, Mr Ramirez?

MR RAMIREZ: Sir, she had a limited amount of trading data --

MR JOWELL: Yes, and it was from one bank only.

MR RAMIREZ: Yes, sir.

MR JOWELL: It was -- importantly, it was long before the cartel period and also before the advent of electronic trading, wasn't it?

MR RAMIREZ: I do not have it in front of me, but yes, I think -- I think that is the case.

MR JOWELL: Yes.

You see, what I suggest is there is not actually a solid basis here for you supposing that you are going to be able to identify resting orders and then exclude them. It is a hope. It is a hope, Mr Ramirez, is it not?

MR RAMIREZ: Well, sir, I would say it was a bit early to say, because you directly cited the defendants' response, but I believe in their rejoinder they mentioned that it is not universally available. Now, the import of that is uncertain at this time. We do not know, for instance, whether --

MR JOWELL: Okay.

MR RAMIREZ: -- (overspeaking) -- you can see what I am saying. Some defendants may have --

MR JOWELL: -- (overspeaking) -- you see the difficulty that we have, you see, is that, you know, you have said your methodology is going to be to exclude this data, and we say, well, what happens when it turns out that you cannot exclude this data for most of the banks. Your back up plan, I think, is what we have in the last couple of sentences of your paragraph 52, where you suggest that:

"... the proposed defendants' response suggest that the ... defendants retain at least some data related to their resting order volumes."

And you say that:

"I could therefore reduce aggregate damages using proportions of resting order volumes drawn from the data the proposed defendants do retain on resting orders and/or salient literature."

Now, I am afraid we're bit confused by that. Are you saying that if -- let us suppose -- you are saying, if we cannot identify and exclude the resting orders, because you cannot match the two data systems, then what we are going to do is effectively say, well, resting orders, they are roughly -- first of all, you are going to then have to do your estimates of effective spread including the data from resting orders, right? Then, you are going to say, right, we have done that, made the estimate based upon including resting orders, and now we are going to say resting orders are roughly 10% of all orders, so we are going to reduce aggregate damages by 10%. Is that -- have I got that broadly right, or is there a different plan here?

MR RAMIREZ: I would just say, of course, we already discussed about, well, at this point it is premature to say what -- what --

MR JOWELL: -- (overspeaking) --

MR RAMIREZ: -- (inaudible) -- to get --

MR JOWELL: I am just saying 10% illustrative.

MR RAMIREZ: But, to the extent that that is the case, yes, we would then plan to reduce aggregate damages to exclude these because they are not in the Evans classes.

MR JOWELL: Okay.

But is there not then a double count? Because you have got the resting orders in, right? You say they do not -- you do not earn any spread on those, so they are deflating the damages already, and then you are doubly deflating the damages by then taking out that chunk of volume, right?

MR RAMIREZ: Well --

MR JOWELL: How is that in the interests of the class?

MR RAMIREZ: Well, sir, I do not -- I am not sure that that is quite the case. I do not want to speak for Mr Knight and Professor Rime. I would say that the customer does not pay the spread in some instances, they can discuss under which circumstances. I would just say, yes, to the extent that the spread was quite small on these transactions, or it was zero, it would not function into the overcharge analysis.

I do not think that is necessarily detrimental to the class, I think it is a --

MR JOWELL: Taking out all the volume that they relate to would be detrimental to the class, right? Because

-- (overspeaking) -- first of all, you are saying it is reducing the effective spread, and then you are chucking out 10% of the -- or whatever it may be, of the volume of commerce, you say.

MR RAMIREZ: Right, I think that is -- that is an assumption there that the regression analysis, the way the observation is constructed, whether that price is exactly equal to the benchmark or not. So, I do believe that it is conservative to leave them in and back out the volumes, which seems to be around 5%. But this can -- the extent to which the defendants do have data and how that data would really help us in this process is yet to be seen.

THE CHAIRMAN: Mr Ramirez, you deferred to Mr Knight and Professor Rime in this, you were answering for yourself.

If either of you two gentlemen have anything to add -- not inviting it, but if you do, then now's the time.

MR KNIGHT: Nothing to add.

PROFESSOR RIME: No.

THE CHAIRMAN: Mr Jowell.

MR JOWELL: You see, Mr Ramirez, I would suggest that this just has not been properly thought through, this back up plan, because what you are doing is a double whammy to the class. You are first reducing the effective spread by including these, on your approach, on your view of the market, and then you are going to take out the volume. You are going to reduce damages. Well, I have put the point.

MR RAMIREZ: I think it is true that damages would be reduced, but the extent which the effective spread calculation identifies those as having no spread or not, which is different from whether they actually carry a spread, is to be determined.

So, yes, it is possible that our damage estimate will be conservative using this method, but I would say that this is an instance where we are saying, here's a back up plan that we can use, but first we need to see what the defendants have to say about the universality of the data.

I accept that there are unknowns at this point and that may have ramifications. To the extent we can use the defendant data to help work out some of these difficulties, we of course will.

MR JOWELL: Well, we can all live in hope, Mr Ramirez.

Can I turn to another topic.

THE CHAIRMAN: Mr Jowell, can I just enquire how you are doing, just ...

MR JOWELL: Well, what I am planning to do, sir, is to simply go for as long as I can until I am cut off. So you are going to have to just call a guillotine whenever it is appropriate.

THE CHAIRMAN: Okay, that is helpful, Mr Jowell. The reason I ask is I am quite prepared to use the short adjournment -- and I think we will -- but Professor Neuberger has got some questions and I am keen to give him 15 minutes. So, what I am going to do is I am going to allow you to run until 10 past.

MR JOWELL: I am grateful.

THE CHAIRMAN: I appreciate we are all cutting our cloth, but at the end of the day, this is an impressionistic process not a fact-finding and determination process, so --

MR ROBERTSON: So does that mean that we are dispensing with re-examination today?

THE CHAIRMAN: It does not mean that, no, Mr Robertson. We will have Professor Neuberger and then we will have you, and we will then have ten minutes for lunch. It is in your hands, Mr Robertson, how quickly we eat our sandwiches.

MR ROBERTSON: I will bear that in mind.

THE CHAIRMAN: I will leave it that way.

Mr Jowell.

MR JOWELL: Thank you.

Mr Ramirez, could I ask you to turn to a different topic, and I would like to look at the neutral statement, paragraph 24, of Mr Evans, which is in {AB/17/20}, and you see that Mr Evans', paragraph 24:

"... proposes to use two classes is consistent with his theory of harm ..."

And well, we can discuss direct and indirect harm. Then, you say:

"Similarly, the approach to estimating the harm suffered by Class A and Class B will be different due to the different data sources that will be used to calculate the harm to each class ..."

And you say:

"... as is explained in paragraph 34 below."

Now, I looked at paragraph 34 below. I think you meant -- or they meant paragraph 38 below, which is {AB/17/34}, and you see there, paragraph 38, "Overcharge: available data" and they say:

"Mr Ramirez has identified multiple sources of available data to operate his methodology.

"Harm to class A could be calculated on the basis of the Proposed Defendants' transaction data."

Then we see:

"Harm to class B could be calculated from a combination of the following data sources."

The first one is the same:

"The Proposed Defendants' transaction data."

So, no change there.

And then we see a combination -- three other sources that you identify, and I would just like to discuss those with you a little.

So, if we go from the bottom up, the last one is:

"Data from Reuters and EBS ..."

Now, that is the interdealer market, yes.

MR RAMIREZ: Yes, sir.

MR JOWELL: And I think we heard from Professor Rime earlier, who said that is unlikely to be representative of trades between customers and dealers, it is going to be a very conservative estimate of the effective spread between customers and dealers; correct? You recall that is what Professor Rime said?

MR RAMIREZ: I do, Mr Jowell. I would just make one caveat to that, sir, and that is, as I mentioned to Mr Hoskins, that the class B does conduct a certain number of transactions -- (overspeaking) -- interdealer markets.

MR JOWELL: You say 16%, something like that?

MR RAMIREZ: According to BIS/BoE, sir, those are the --

MR JOWELL: So 84%, it is going to be conservative, is that right?

Professor Rime, I think you might want to add something?

PROFESSOR RIME: Thank you.

So in order, data from Reuters and EBS are supposed to be used to measure adverse selection, and for that purpose those are the perfect data. That is the source you want to use in order to study that element.

MR JOWELL: But that is not going to suffice, is it, to get to an estimate of the harm to the non-defendants, it is going to be a step on the way?

PROFESSOR RIME: Yes.

MR JOWELL: Thank you.

You then refer to, going up, "CLS Bank International", yes?

MR RAMIREZ: Yes.

MR JOWELL: Now, could we perhaps look at an article on this. It is {C/30.1/1}.

THE EPE OPERATOR: My apologies, but I have not got 30, I am afraid, on the list. I am going to refresh my tab to see if that pops up, but if you could double-check the reference, please, that would be very helpful.

MR JOWELL: I am pretty sure the reference is correct, it is just -- I think it was recently added.

THE EPE OPERATOR: Right, bear with me, please.

MR JOWELL: Like, as in two days ago.

THE EPE OPERATOR: So I will try that again.

MR ROBERTSON: Does Mr Jowell mean B rather than C?

MR JOWELL: Forgive me, {B/30.1/1}.

THE EPE OPERATOR: Okay, here we go, thank you.

MR JOWELL: Thank you, I am so sorry everyone.

We see that this is a working paper from the National Bureau of Economic Research on "FX Market Metrics" and it is specifically about "New findings based on CLS Bank settlement data".

If we can go to -- I think it is page -- to page8 {B/30.1/35} of this.

You see the main -- first main paragraph:

"The fact that time-stamps and sequencing in settlement instructions do not appear to correspond closely to market transactions means that many standard liquidity measures ..."

And then in brackets:

"... (quoted spread, effective spread, price impact and so forth) are not available."

So, according to this at least the data -- this data is not going to enable you to calculate effective spreads, is it?

MR RAMIREZ: Well, sir, I would have to disagree there, and these same authors -- there was a version of this that was in Professor Breedon's report and there is a subsequent article by both of these authors that essentially look and try to match the market quotes with the settlement time in the CLS data, and that showed their analysis there that 50% of spot trades closely matched with the quotes within about ten seconds and 80% were in a minute.

So, these authors -- of course, this version was posted last night, so I have not seen how it changes from others, but their other research seems to indicate that the difference between the quotes on the market and when it is settled in CLS can be quite short.

MR JOWELL: Okay, so -- but let me ask you this. This data, it is anonymous, right?

MR RAMIREZ: It is -- I am only hesitating here, Mr Jowell, because CLS has quite a lot of data at their disposal. What they have given me a sample of is not necessarily everything that would give --

MR JOWELL: Okay, what you have got is anonymous?

MR RAMIREZ: Yes.

MR JOWELL: Okay.

So then, now, the cartelist defendants, they are about 25 to 50% of the market at any one time, right?

MR RAMIREZ: -- (overspeaking) -- participation, yes.

MR JOWELL: Okay. So they are a substantial part of the market. So, any data like this that you have that is anonymised is going to include the defendant data?

MR RAMIREZ: Yes, that's correct.

MR JOWELL: Okay.

What is the plan to exclude that?

MR RAMIREZ: Well, are we talking about CLS or the anonymised? I think --

MR JOWELL: It is all anonymised, (inaudible), Reuters, CLS, CBOE; it is all anonymised, right?

MR RAMIREZ: Of course. Sir, when we discussed Reuters EBS as well as versions like HotSpot that are transactional, then conceivably the transactions in the defendants' data, because their sales, their transactions can be identified in the anonymous transaction data. So, if a transaction, for instance, is conducted by the customer on Reuters EBS, then we should see that transaction appearing -- we should be able to match that to the Reuters EBS data, so then that transaction can be removed, and I discussed that in my first report.

MR JOWELL: Really? With the volume of data that we are talking about, with the number of trades per second, you can match? How are you planning to do that?

MR RAMIREZ: Well, sir, if a transaction is in the defendants' data, say that a hedge fund, for example, was trading using the defendants' credentials on Reuters EBS through prime brokerage agreement, that transaction, of course, could be settled by the bank -- and Mr Knight can perhaps weigh in, in case I misstate anything -- and that transaction will appear in the defendants' transaction data. So, the information regarding that trade can be pulled from the defendants' transaction, matched to the interdealer data --

MR JOWELL: Matched. How do you plan to match it?

MR RAMIREZ: Well, of course, there is a match -- for example, you would have the transaction time, the timestamp of the trade --

MR JOWELL: There are many trades per second.

MR RAMIREZ: Of course, you would have the -- also the quantity, sir, and you would have the price, and these are a few -- and, of course, the currency pair, I should say. So, we should be able to look at the defendants' transaction data, match it to Reuters EBS and then remove those transactions from the data.

MR JOWELL: Let us just suppose you cannot do that, then do we then say that all of this data is actually useless?

MR RAMIREZ: No, I do not think -- I do not think that is the case, sir. I mean, it will essentially still yield an overcharge estimate that is more related to what would occur across all participants. But I, frankly, am struggling to see how, given what we know about what would be in the defendants' transaction data, how we will not be able to match it to Reuters and -- find the transaction in Reuters EBS and (inaudible).

THE CHAIRMAN: Professor, you have something to say, and then I think I will let Mr Jowell have the last word, but that will be it.

MR JOWELL: Thank you.

PROFESSOR RIME: Thank you.

So there is a recent paper in the Journal of Financial Economics by Angelo Ranaldo and a co-author that used the CLS data to create a measure of -- or estimate of adverse selection cost. So, these data will not be useless for creating that -- that measure in case we would not have Reuters and EBS. Then, yes, possibly, if we only had adverse selection cost, there is a lower bound of this indirect cost, but there is a measure that is relevant.

Thank you.

MR JOWELL: So, could I just ask two final questions, very short ones, very specific.

Professor Rime, you co-authored a paper with Professor Breedon not too long ago in 2013, published in 2016, and I take it that, as someone who you co-authored a paper with, he is a respected member of the profession and your field? Could we just have the "yes"?

PROFESSOR RIME: Sorry, yes, yes.

MR JOWELL: Yes.

And Mr Ramirez, if I could just ask you this -- and forgive me for this question, but just to be clear, you state in your report that you specialise in economics and statistics, and I appreciate that, you know, one can, to a degree, pick these things up on the job, as it were, but just so that we understand, it is correct that you do not have any published articles or books to your name in any peer reviewed journals; is that correct?

MR RAMIREZ: That's correct. No need to apologise, sir. I have been a practitioner in this -- in this business for a while, maybe 20 years or so, but correct.

MR JOWELL: Well, I am grateful. I have no further questions.

THE CHAIRMAN: I am very grateful, Mr Jowell. Thank you very much.

I am going to hand over now to Professor Neuberger, who has some questions, but I am going to apply a similar guillotine to him at about 15 minutes.

Professor.

Questions from THE TRIBUNAL

PROFESSOR NEUBERGER: Thank you very much.

I am going to -- I have got some really rather higher level questions, more generic, and I guess this is primarily for Professor Rime. In the -- essentially what you do is you start in your report from the findings of the Commission decision, inevitably, which relate to specific actions by a number of dealers acting in a cartel, and you show, using quite well established economic arguments, how the effects of these actions would go beyond the immediate days, the immediate currencies, the immediate deals, the immediate sizes and so on. There would be spill over effects which would then affect the whole market, and if I understand you right, although you can talk about these effects qualitatively, the only evidence that they are significant would come from actually running regressions; that is correct?

PROFESSOR RIME: Yes.

PROFESSOR NEUBERGER: So that if I -- if one were curious as to whether the market in this particular cross-currency pair or that size, or deals on this particular venue were actually affected by the cartel, then the answer would come out of the regression?

PROFESSOR RIME: Yes. I mean, I theorise about it and I believe it is likely that there will be spill over effects, etc, and that there will be effects in between the chats that I -- that I identified or exemplified in the decision. But yes, it is just theory, it must be shown in the empirical analysis.

PROFESSOR NEUBERGER: So once -- I mean, at the moment, the class of people in the class or classes who are represented are quite broad, but it is possible, once you get the data, that -- it is actually possible to draw the class much more narrowly if it turn out that the spill over effects for certain groups of customers are statistically insignificant?

PROFESSOR RIME: Yes.

PROFESSOR NEUBERGER: That is right.

I would like to move on to the question of size of transaction. I mean, I used to do this in microstructure myself a long time ago, and I am out of date, but could you just explain the impact of information asymmetry on trade size.

PROFESSOR RIME: Yes. So, the better -- the more -- we need to take the dealer perspective, yes? The more confident the dealer is about his information advantage, the larger volume he would prefer to trade all as given. However, there is theoretical work that explains that the counterparties or these work by Easley and O'Hara that counterparties would use large trading volumes as signal of very precise and high quality information, which will work counter to the actions of the dealer. That is partly one reason why you see dealers in the interdealer market trying to split the trades in smaller trades, so to not reveal their intentions too quickly so that they are able to sort of implement their trade.

So, larger -- larger trading volumes typically signal stronger information, and I hypothesise that by sharing information and discussing it in chats, they become more confident because, by sharing and getting cross-checks, etc, they get the better precision that this is sort of a solid piece of information.

PROFESSOR NEUBERGER: Let me cut more closely to the quick. In the estimation of damage, for example, obviously this is very approximate at this stage, there is no data and so on, and we accept the limitations of all that, but the figures that are put forward are based on the assumption that the effect of the cartel would be to widen the spread on all transactions by, say, two pips or whatever it is, and to me that just sounded implausible. It seemed to me most unlikely that the effect of adverse selection and so on would be the same amount for a small trade when there is great volume going both directions from the sorts of trades which the cartel participants were actually executing in the market, which were very much larger trades.

PROFESSOR RIME: So, in the analysis, so the typical analysis for estimating adverse selection on interdealer -- on interdealer data would capture the adverse selection as a constant, hence missing this dimension that it would be even larger if trading volumes were -- were larger. So --

PROFESSOR NEUBERGER: But -- sorry, can I just push you a little bit. Instead of having something which -- some close function or specification, are there really strong reasons for believing that the cartel would have had anything of the same order of effect on the spreads in the mass market from what it would do in the voice market in the hundreds of millions of dollar size of transaction?

PROFESSOR RIME: So, I mean, there are already studies identifying adverse selection components of the bid-ask spread based on data from interdealer markets, so adverse selection is a big issue in interdealer trading. My theory of harm, that makes me believe that it is definitely very likely that dealers would use their information -- their ability to share information to trade one step more aggressive because they can share information and get more confidence and that would increase adverse selection in the interdealer market.

PROFESSOR NEUBERGER: But the -- I mean, you yourself have written quite a lot about the difference between the bid-ask spread at the touch and the true cost of trading, and I am just wondering whether the sorts of behaviour you are talking about -- we are talking about in the cartel would have had that much effect on the touch, whereas I can quite see the argument that it would have a big effect on larger scale of trading.

PROFESSOR RIME: So, that is why I say that typically we are not able to sort of really study the effect further out in the book. That is difficult. So it is on the touch, yes. It has been identified at the touch and it is up to the data to be analysed to see if there is an impact at the touch.

PROFESSOR NEUBERGER: Can I -- my last area of questions is the following. When the stories about the chat room originally came out, the focus of the press and, subsequently, of the regulators was very much on the front-running, on the manipulation of the fix and so on, that the claim that is -- that we are now considering is of a very different nature, it is the impact on the spread. I wanted to ask kind of very -- and it does not capture the damage done specifically to the people who were placing orders at the fix and people who were front-run.

I wanted to ask what is a very general question, but I cannot think of anybody better than you to answer it. If I look at the damage done by the cartel on the basis of what we know, can you give me any sense of what proportion of that damage is covered by the claim that we are discussing, and is this the major part of the damage done by the cartel or is it a fraction?

PROFESSOR RIME: So, it is a difficult question, but I would think it is -- this is a huge chunk of the damage, because it influences the bid-ask spread of each -- each customer trade throughout the day. Front-running at the fix, that is, of course, also a quite sizeable damage, but it is not a class-wide damage because, at the fix, some buy and some sell and those -- the average -- if the average typically buy, of course, those are harmed, but those that sell, they gain. So it is not that easy to think of it as a class-wide harm.

But fix front-running is definitely also an important part. It is difficult to know how much fix trading is compared to overall trading. I have a paper together with people from the Financial Conduct Authority where we tried to sort of put this a bit in perspective, tried to see how big is fix interdealer volume compared to volume rest of the day, and you see that proxy, I would say the majority of the cost would probably be by raising each customer's bid-ask spread and not by the fixed front-running.

Other type of front-running, I believe, is limited because front-running, outside of the fix, is extremely difficult, because you need to forecast the customer trade, and out of the -- besides around the fix, doing that forecast of the customer trade is very, very difficult.

PROFESSOR NEUBERGER: But, I mean, if one judges by what has been published of the chats --

PROFESSOR RIME: Yes.

PROFESSOR NEUBERGER: -- it looks as if the prime objective -- I mean, it is impossible to say too much because we do not have all the chats and so on, but what has been published gives the impression that the purpose of the chat room was primarily aimed at the victims you are not representing -- you are representing -- the victims who are not in the class, and it seems strange that you have a -- I mean, it is worth observing, if there is a cartel operating, that these classes are not the prime intended victims, these are the kind of ancillary, secondary victims; is that right?

PROFESSOR RIME: So, as I said, I think that the harm by raising cost for each customer transaction is a sizeable thing, probably very big.

I do believe that they have created damage by fix front-running as well, but since it is not a class-wide harm, it is decided not to be included.

PROFESSOR NEUBERGER: That I understand. Thank you very much, I think that completes my questions.

THE CHAIRMAN: Thank you, Professor.

I am not going to invite any of the persons already cross-examined to come back on that, but Mr Robertson, I am going to hand over to you. However, I think what we will do is we will take a break now and you will have your half hour or less to cross-examine when we resume at, let us say, 2.45. Does that work, Mr Robertson?

MR ROBERTSON: Sir, I could be 15 minutes in re-examination, but I am happy to start that at quarter to.

THE CHAIRMAN: Well --

MR ROBERTSON: You said "cross-examination", it is --

THE CHAIRMAN: Oh, I am so sorry.

MR ROBERTSON: -- re-examination.

THE CHAIRMAN: I mis-spoke. I was not going to permit the cross-examiners a further bite of the cherry, but you have your re-examination, but we will start that in 15 minutes time.

MR ROBERTSON: Very good.

THE CHAIRMAN: So we will resume at quarter to. If we can keep the live stream going. I know people will be looking at a blank screen, but it will save us a minute or two restarting it, and if everyone can mute their microphones and still their cameras, we will be back at quarter to. Thank you all very much.

(1.29 pm)

(The short adjournment)

(1.48 pm)

THE CHAIRMAN: Mr Robertson, if we have got good communications, over to you.

Re-examination by MR ROBERTSON

MR ROBERTSON: Thank you very much, sir.

I have got some questions in re-examination, first, for Professor Rime, then for Mr Ramirez, and then, finally, for Mr Knight.

Starting with Professor Rime, I would like to ask you a few questions about a point raised by the Tribunal during the hearing yesterday and the point is, in short, how each PCR's experts say that the infringements identified in the decisions cause harm on a class-wide basis, and it is a point that was obviously being explored earlier on today as well.

Could I ask you, please, to go to your first report, bundle {EV/9/45}. Section 5, you first discuss how harm would be caused to members of Class A, and that is section 5.1 of your report, and a convenient summary of your views can be found at paragraph 152 of your report, so that is on page {EV/9/48}.

Professor Rime, please can you explain how you say the sharing of bid-ask spread information caused class-wide harm to members of Class A, referring to paragraph 152 of your report? If you can just elaborate on that a bit.

PROFESSOR RIME: Yes, thank you.

So, just one second, because I lost connection, but I can ...

So, the decision described that there are what they call "occasional" chats concerning bid-ask spread. That is both for a specific trade, but also for more general pricing strategies. So, my point -- so, obviously, in some sense, at least to me, at those particular occasions, they are obviously in a position to coordinate their bid-ask spreads to customers. So, however, my view is that it would be in their interest, ie to maximise profits, to attempt to utilise this information that they gain from the chats also between periods when they change information on bid-ask spreads. One might think that would be extremely difficult, but I think not, because the concept, the part of the bid-ask spread that captures -- would capture excess profits, that is basically a constant. I call it "baseline spread", but it is a constant. And these dealers then --

MR ROBERTSON: Sorry, could I ask you just to explain that baseline spread in more detail since you regard that as being significant.

PROFESSOR RIME: Yes, yes. So the baseline spread is a constant spread for which, in normal circumstances, when market conditions are, say, at its average, the spread would vary around this constant. Of course, sometimes market is very volatile, maybe warranting higher by the bid-ask spreads, but by sort of adjusting this constant, this baseline spread and keeping the same response to varying market conditions, they can maintain the sort of how they were doing pricing earlier, but just raising this baseline spread, this constant.

So all they need to coordinate on, tacitly, I argue, is this constant baseline spread raising -- raising that, and that -- by doing that, they would be in the position to increase their profits because they are able to benefit more on each -- each customer trade, not only on those particular occasions when they shared information.

MR ROBERTSON: Thank you.

If we move on to class B. If you can turn to page {EV/9/53}, paragraph 167. This is where your section of your report on "Class B: indirect harm" starts. So it is a similar question here. Please could you explain to the Tribunal the ways in which you consider that the infringements caused class-wide harm to members of class B?

PROFESSOR RIME: Yes, thank you.

So, there are two channels for this. First -- and we will label these "indirect". First, it is by raising their spreads to their own customers, they are making the market less competitive. Some of their customers might respond to this by seeking better bid-ask spreads by from other banks, and this would signal to all the banks, the non-cartel banks, that they are also in a position to increase their bid-ask spreads. So, it rests on that the dealers are able to increase their bid-ask spreads continuously in between the chats. If they are able to do so, then they reduce the competitiveness in the market and other banks might also be able to increase. So that is the first part of the indirect cost.

The second is the -- is the adverse selection part. So then it is important to remember that the cartel does not need to share what I call "tradeable information" continuously in order to have an adverse selection impact in the market. Adverse selection might arise if there are even quite infrequent events where some might have an information advantage that they utilise in their own -- own trading. So, by getting this -- sharing this information in the cartel, they get an information advantage they would not otherwise share -- get to learn this information, they would not otherwise have this cross-check of their own information, and this enables them to profit in speculation in interdealer market, and other dealers would experience losses from this.

MR ROBERTSON: Fine. So, if I can just ask you to turn to page 60 {EV/9/60} and paragraphs 187 and 188, and I think that explains that in a bit more detail; is that correct?

PROFESSOR RIME: It has not shifted, is it?

MR ROBERTSON: I think it has just shifted.

PROFESSOR RIME: Yes, yes.

MR ROBERTSON: So it is paragraphs 187 and 188, and that sets that out in a bit more detail.

PROFESSOR RIME: Yes, absolutely. So, the idea is that you have these events where they chat, they share information, they cross-check information, they get more confidence that this information is tradeable. They trade in the interdealer market. That is where they implement their speculative trades. Those that are providing liquidity in the interdealer market, they will then, as this information eventually becomes impounded to prices, experience a loss. So that is a loss to those liquidity providers by being adversely selected into the trade, and since they do not know in advance that they might be exposed to such an event, they need to have a protection, a rise in their bid-ask spread continuously, not only at these events, because these events can arise at any point in time. But they do not have to arise continuously in order for being such an adverse selection component. That would be actually a situation where the market would be breaking down, because they could never recoup their losses.

But in order to experience the loss, it is important that this price change is persistent or permanent, not transitory, because if it is transitory, that means that, evaluated at different points in time, they may not experience a loss.

MR ROBERTSON: Right.

Just to tie this back to the decisions, if we can go back to page {EV/9/55}, so page 55 in this bundle, paragraph 174, and you will see there that it says:

"The Decisions state that the members of the Cartels shared the following specific categories of information."

Please could you briefly go through each of these, one by one, and explain whether these types of information, if shared, would give rise to increased adverse selection risk?

PROFESSOR RIME: So, I interpret the first part there primarily as a request from a dealer to other dealers to not stand in their way when they are doing risk management, inventory control. Inventory control has temporary price impact:

"Information on outstanding customers' orders."

That is the category where I believe they can utilise for this -- this spare interdealer speculation:

I do not -- sorry, it is -- the screen is small, but ...

So, "current or planned trading activities", to the extent that that is signalling that I have received the customer trade and want to speculate on it, yes, that would be a case for having this coordinated trading. That gives rise to adverse selection. To the extent that that is signalling front-running, that would not give rise to adverse selection because front running has a temporary impact on prices.

And, "Information on bid-ask spreads", that utilised for the coordination on spreads to the customers, not for interdealer speculation.

MR ROBERTSON: Thank you.

Finally, Professor Rime, on a distinction that you draw between direct and indirect harm, Mr Jowell asked you a number of questions about the effects of the cartels and he queried whether it really mattered to distinguish between direct or indirect harm. He takes the view you can just roll it all up together. So can you explain to the Tribunal why you have distinguished between the direct and indirect harm caused by the cartel.

PROFESSOR RIME: So it matters because it has consequences for the estimation of harm. There is most likely the size of harm from these two different types of actions is most likely different because they happen in sort of different parts of the market. Direct harm happens in the dealer/customer segment, while adverse selection in particular is arising in the second tier of the market, in the interdealer segment.

In these two segments, they have different information available, so their decisions for quoting bid-ask spreads in these two different segments are based conditional on different types of information, so you need to distinguish them to estimate them in a precise way. If you just pool it together, you get less precision because the model is not tailored to the question that you are studying.

MR ROBERTSON: Thank you, Professor Rime.

Mr Ramirez, I think I have got two quick follow-ups.

MR LOMAS: Sorry, before you leave Professor Rime, can I just ask one question for clarification?

Professor Rime, it was on the direct harm point.

I think there is a danger, particularly with this system whereby not all words are picked up of plurals. If you talk about a customer, if you are specific, if you are talking about "customers" with an "S" on the end, it is very easy to take it as a generalised comment about the market and I was not quite sure what you were saying.

I understand, at least conceptually, you can argue about whether it goes up or down, that spreads may be affected by an exchange of information between the cartel participating banks. But -- and I can understand how that effect on spreads applies to the prices quoted to the particular customer whose transaction is being considered in the chat rooms, assuming that we are talking about a specific transaction. What I do not fully understand is your theory as to how, if spreads were affected by discussions about a specific transaction in the chat room with a third party, you generalise that impact on spreads out to all other spreads being applied by the banks and the cartel for the rest of that day or trading period in relation to other customers which do not feature in the chat rooms and for which those banks can assume to be in competition for that business.

PROFESSOR RIME: So, I mean, first, it is completely possible to do this because these dealers, they of course are very clever in their price-setting, so they know exactly how they adjust the bid-ask spread to this type of customer under this type of market conditions. They continue with the same type of behaviour in relation to the economic conditions, like customer type or economic conditions, they simply just adjust this constant that they can have common to all their trades, including electronic trades. So electronic trades typically trade at that more narrow spread, so that is just keeping -- raising this baseline spread, taking account of volatility, and then, adding the condition that, at this type of transaction, at this platform, spreads are adjusted somewhat downwards, but it has all just lifted this whole pricing strategy, that is important -- that is why it is important that they are enabling to share information strategies, and that they can coordinate on their specific trades on this platform, that platform, that customer, that size, they have to take care of themselves as they did earlier.

Competing for the same customer, so I think that is the whole point of creating a cartel is that when, outside of a cartel, you compete, you minimise your spread in order to attract the customer of your competitor. When forming a cartel, you get the -- gain the market power that could allow you to increase the spread without possibly losing that customer to your competitor, because if that customer went to some of the other cartel members, yes, they would see the same -- same bid-ask spread, hence most likely not shift.

MR LOMAS: Sorry, I understand that would be the case if the banks were agreeing a price line in relation to spreads. That would be a classic cartel. But your impact on spreads is a consequence of an information asymmetry or an exchange of information around a specific transaction, and perhaps we should not spend more time on this because I do not want to delay the timetable, but I think the issue that we are trying to get at is how an exchange of information around a specific trade --

PROFESSOR RIME: Yes.

MR LOMAS: -- or a specific customer order, which may well be cartelised and which may well be outrageous behaviour by the dealers concerned, would affect the spread on trades an hour later in relation to a completely different set of customers where the banks may be competing, or at least where the Commission decision does not say that the banks are not competing.

PROFESSOR RIME: So that is because they are able to infer a pricing strategy around this elevated baseline spread.

So when they discuss that particular case they know volatility is at this level, the type of customer is of this type, etc, all these economic conditions. If you did an adjustment according to all these economic conditions, you would, in ordinary circumstances, end up at the spread of, say, five pips. In this particular case with these conditions, you end up with a spread of seven pips. That is like an adjustment of this baseline spread of two pips, and then you apply those two pips in addition, two hours later, to the changed economic conditions that have occurred two hours later or two days later, what have you.

MR LOMAS: So, sorry, to nail it, your assumption is, that increase in two pips becomes sustainable in the market despite the other competitive forces going on, it does not reduce back to the competitive rate?

PROFESSOR RIME: Yes.

MR LOMAS: Okay, thank you.

MR ROBERTSON: Sir, if I may turn now to Mr Ramirez. I have got a couple of quick questions. The first one follows on from Mr Jowell's questioning this morning where he introduced this concept of indirect feedback harm, and so you have got Class A suffering direct harm as set out by Professor Rime, but then also feedback harm from adverse selection risk. Would it be possible to distinguish between the two types of harm being caused to Class A? Is there a methodology for doing that that you are aware of?

MR RAMIREZ: I think, if I understand you, sir, the question is, how much of Class A may be -- harm may be attributable to the feedback mechanism from Class B.

MR ROBERTSON: Yes, it is really, is there a methodology for distinguishing and identifying that feedback harm?

MR RAMIREZ: If it was necessary, it would. Of course, if we were computing aggregate damages to the Class A, it would not be required. But if we had to disaggregate it, we could look at the overcharge related to adverse selection risk and how that feeds back to the defendants' own prices, and so a comparison of sorts could be made between the overcharge on the banks' transactions that are in Class A with the transactions due to adverse selection.

MR ROBERTSON: Thank you.

The second question I have is really to put something to you that is raised in my learned friend's skeleton argument. So if we could have bundle {AB/1/8}, and if you see there subparagraph (2), "Regression specifications", and they set out what they say they are going to do, and then say:

"By contrast, without interrogation of the data, the Evans PCR still exhibits a strong predisposition to a vigorous defence of the single dummy variable model, despite significant potential issues ..."

So my question is, what is your response to that?

MR RAMIREZ: So, I think there is a couple of issues, sir. The first issue is that, yes, it is correct in the first report for the purpose of giving a function form for the regression equation, it was a single dummy variable. Now, that does not imply that the overcharge is the same over time. What it does is it estimates the effect of the overcharge over time, and for the purpose of aggregate damages, that would be sufficient.

Now, to the extent that that overcharge needed to be disaggregated in accordance to time or in accordance to different types of transactions, that could be accounted for in the dummy variable approach, and I do not exclude that to the extent it is necessary to do something more refined than an aggregate overcharge to the class.

MR ROBERTSON: Thank you.

Mr Knight, coming finally to you. It has been said both in writing by the O'Higgins PCR that your industry expertise is relatively limited since your background is only in FX sales, and that, again, was put to you this morning by Mr Jowell. Just so we can be clear about your expertise, could you please explain to the Tribunal whether your role in FX sales gives you knowledge of FX trading, and if so, how?

MR KNIGHT: I think in one of my reports I laid out the structure of a dealing room. The FX sales desks are very closely interrelated with trading desks because the level of sophistication of client that tends to come through to a dealing room is needing, shall we say, attentive service as far as execution of trades go, information as well. So the proximity to us and the trading desks is always very close. Of all the banks I have worked in, I have probably not been further than about eight feet from the trading desks, except once when there was one in Paris and I was in London.

When it comes to actually transacting the orders, the -- sort of the immediate information that needs to be transmitted is intense, and certainly, when it comes down to the actual level and execution when the prices hit, clients are very demanding about knowing when their orders are done, they do not want prices missed and when they are done they need to know that they have got best execution. So we are an interlocutor between the trading desk and the clients and, as such, we have to have full knowledge of the methodology of the traders, how they run risk, because it also affects the clients, and also how the trades are managed between client and trader. So we are -- we have to have expertise in both trading side and the client side.

MR ROBERTSON: Okay, I can see how that gives you expertise within your own bank. Can you explain whether your experience enables you to know which other banks or institutions were operating as an FX dealer during this relevant time, 2007 to 2013?

MR KNIGHT: Yes, of course. Though traders may experience their direct counterparts coming through, on the sales desks, we have to be very aware of who our competition is. So we will also study reports, whether it is things like Euromoney surveys, etc, or even listening to our clients, of course, who are constantly giving us feedback about how our service is against others. So we are very aware of who the competition is in the market. There is dynamic job movement as well within the sales desks between banks, so a bank desk may well consist of staff that have been at previous banks, so general knowledge of the state of the market is imperative to salespeople, and that includes who our competition is.

MR ROBERTSON: So, picking up on that, as you are aware, one of the issues you have addressed is who are the relevant financial institutions within the Evans claim, and it has been put to us that the banks you identify include

Chinese banks and the evidence for this, which is referred to in my learned friend's skeleton argument -- it has not been formally exhibited, but it has been put into the bundle -- is a chat, and so if I could ask for bundle {B/46/47} to be shown on the screen, and this is referred to by my learned friends. It is chat number 234. We can see it is the Essex Express. What I would invite you to do is just assist us with deciphering what is going on in this chat, and in particular, does it refer to a Chinese bank? If so, can you tell which one?

MR KNIGHT: The reference to China, I would read -- and this is supposition and, of course, I cannot prove it in the context of this chat, but any references to China or as we see there to "the china man", would, in my mind, be referring to a bank in China.

MR ROBERTSON: Are you able to tell which bank in China?

MR KNIGHT: I could -- I could suppose that it might well be the largest Central Bank, or the Central Bank in China, but that, once again, would be supposition. But the tendency would be for me to assume that would be the case.

MR ROBERTSON: What is the basis for that assumption?

MR JOWELL: Forgive me? Can you hear me? I have moved computers. But this is, I fear, straying well beyond re-examination in any traditional sense.

MR ROBERTSON: No, it is not.

MR JOWELL: It is just going to arise out of the questions that are put in cross-examination.

MR ROBERTSON: Yes, and the question that was put to --

MR JOWELL: And it is also now straying into clearly leading questions.

MR ROBERTSON: No, the question that was put to Mr Wright was that he did not have sufficient experience to be able to give expert opinion. This is a document that you rely upon to rebut his evidence. It was only put into the bundle at the end of last week and so this is the first opportunity that -- indeed, the only opportunity in this hearing for Mr Wright to address it.

THE CHAIRMAN: Mr Robertson, I am going to let you put the question. I think Mr Jowell is probably right that it does not arise out of the cross-examination, but then the cross-examination has been necessarily rather episodic in terms of what it has focused on and it seems to me that if there are points you wish to put to your witness, not having had in-chief material that has been put late into the bundle, I am going to let you ask it, but do not make any assumptions as to the weight we will place on it.

MR ROBERTSON: Yes, thank you very much, sir.

Mr Knight -- apologies for calling you Mr Wright, it is obviously subliminal in the context of a beauty parade. You say you have an assumption this might be the Central Bank of China, the People's Bank of -- the Bank of the People's Republic of China, whatever it might be called. Are you able to help why you assume it is a central bank and not an ordinary commercial bank?

MR KNIGHT: As I say, this is assumptive on that chat. There were certainly counterparts in the market that were large and influential. It would appear from that chat they are making a tighter spread to that client than they would to normal other clients, so from that I would assume that they had very large business or were being selectively preferentially treated. Because of that, assumptive of which the largest clients could be, I would tend to think it would be probably one of the largest Chinese banks.

MR ROBERTSON: I do not have any further questions, sir.

THE CHAIRMAN: I am very grateful.

Well, thank you, Mr Knight, Professor Rime and Mr Ramirez. You are released from your ordeal and I apologise that it has been such a staccato run through a huge amount of detailed work.

We will take a break, but not now. I am going to move seamlessly over to the evidence of the O'Higgins experts and if we can proceed to swear Professor Breedon and Professor Bernheim, that would be very helpful.

PROFESSOR FRANCIS BREEDON (affirmed)

THE CHAIRMAN: Professor.

WITNESS: My turn?

THE CHAIRMAN: Yes, please.

PROFESSOR DOUGLAS BERNHEIM (affirmed)

Thank you, gentlemen, and welcome. I am not going to oblige those who are calling you to take you through your various statements and reports, we will take those as read and that is in the interests of time. But if, of course, there are any questions in-chief that you have to ask, well, now is the time to ask them.

MR JOWELL: I have no questions to ask the witnesses.

THE CHAIRMAN: I am very grateful, Mr Jowell.

We will then move over to cross-examination on the part of the respondents and, Mr Hoskins, is it you again or is another of the respondent representatives going to be doing the cross-examination?

MR HOSKINS: I am afraid it is me again, sir.

THE CHAIRMAN: Not at all. Parity of arms, they all get the same examiner. Over to you, Mr Hoskins.

Cross-examination by MR HOSKINS

MR HOSKINS: Thank you.

My name is Mr Hoskins and I am counsel for Barclays Bank. I want to direct the questions primarily to

Professor Breedon, we obviously heard from Professor Bernheim during the teach-in, and I think the questions I have probably go more to your expertise, Professor Breedon. But as happened this morning, Professor Bernheim, I think, if you have material answers you wanted to add, I think the Tribunal would probably welcome that and certainly not dissuade you from doing so. But my questions are really primarily directed for Professor Breedon.

Can I ask, did you watch the cross-examination of Mr Ramirez this morning? Did you have that pleasure?

PROFESSOR BREEDON: I did, thank you.

MR HOSKINS: You did.

Can we start with your CV. So I need to go to bundle {MOH-B/1/2}. Thank you.

I understand from this that you are an expert in FX market microstructure; is that correct?

PROFESSOR BREEDON: Yes.

MR HOSKINS: Have you ever been instructed as an expert in a court case before?

PROFESSOR BREEDON: Yes, once before, yes.

MR HOSKINS: Can you tell us a bit about that case, please?

PROFESSOR BREEDON: I am never quite sure what I am allowed to say in these cases, but it was -- it did not go to trial if that is the question you are going to ask.

MR HOSKINS: It did not go to trial.

Did it involve the calculation of damages?

PROFESSOR BREEDON: Not -- no, not in the stage I got to, no.

MR HOSKINS: Was it a competition law case.

PROFESSOR BREEDON: This is where I need my legal -- I think it may have been. I mean, it was at an early stage and I think it was -- it had similar issues to this one, let us say that. I think I will stop there, because I am not entirely sure what I can say.

MR HOSKINS: That is fine. I do not want to get you into trouble.

Can we go please to your first report. That is {MOH-B/0/54}. You tell us in paragraph 6.7 that you propose to use regression analysis to calculate damages in this case; is that correct?

PROFESSOR BREEDON: Yes.

MR HOSKINS: Can I just ask you to tell us a bit about what experience you have of working with regression analysis. What do you use it for? What sort of typical task would you use regression analysis for?

PROFESSOR BREEDON: So, obviously -- you know, in almost -- well, not all research but it is -- it dominates, particularly for someone like myself, who is an empirical economist, you know, who works with data, almost all my research will involve regression analysis of some sort, and that is across even -- you know, when I have worked on other areas outside microstructure. It is -- it is, you know, a very powerful tool for -- for analysing research questions.

MR HOSKINS: So it is a basic tool in your armoury for your function?

PROFESSOR BREEDON: Yes.

MR HOSKINS: You have put your role as primarily academic; is that fair? What is your -- how would you describe yourself?

PROFESSOR BREEDON: Yes, I mean, I am an academic economist. But I think you can see from my CV, I am in that group who engage quite strongly with policy questions, so direct policy questions. So, if you were to make a distinction, there are some academics who are very, you know, focused on publications and on just, you know, working on that side of the subject. I, partly because of my history of having worked in various institutions, I am also interested in applying, you know, the skills to policy questions directly, so I think I would still call myself an academic economist.

MR HOSKINS: Obviously the expertise that you have overlaps to a certain extent with Professor Bernheim, for example, in the use of regression analysis.

PROFESSOR BREEDON: Yes.

MR HOSKINS: Professor Bernheim has told us a bit about regression analysis. I just want to make sure, or find out if there are any differences between you. I doubt -- we are going to go to the basics, so I would be surprised, but this is your chance to tell us.

I am going to take you to Professor Bernheim's first report. I need to go to {MOH-H/0/36}. I am going to pick it up, you see the heading, "Selection of explanatory variables"?

PROFESSOR BREEDON: Yes.

MR HOSKINS: I presume you have read this before, this is not new to you?

PROFESSOR BREEDON: Yes.

MR HOSKINS: What Professor Bernheim does in this section of his first report is to set out some general principles to help guide the selection of explanatory variables for a regression model designed to estimate cartel overcharges, yes? I just want to check, as I said, that you and Professor Bernheim are allowed -- are aligned, sorry, on the general principles.

So if I can start first of all at paragraph 97, Professor Bernheim explains:

"First, the explanatory variables included in the model must be economically relevant for FX half-spreads. Economic theory and pertinent academic and industry research (eg variables used in academic studies and factors considered by traders in setting bid-ask prices) should guide the identification of the appropriate candidate explanatory variables."

So the first question I want to ask you relating to that is this. Do you agree that economic theory and pertinent academic and industry research should guide the identification of the appropriate candidate explanatory variables?

PROFESSOR BREEDON: I do, yes.

MR HOSKINS: And can you explain why that is important? Why is that the proper approach?

PROFESSOR BREEDON: Well, I think, you know, you went to some of in this morning, but the -- you need a structure to -- in a sense, pick out variables because there is a risk on both sides. There is a risk that you throw in things that are completely unrelated to the subject you are doing, or indeed actually caused by the thing you are doing, so there is this whole problem of not wanting to use variables that I will call "endogenous", that they -- in a sense, they are also caused by the cartel and therefore if you put them in the regression they would bias your result. So there is that risk of putting too many, and there is also, as you discussed this morning, the risk of omitting variables that could be relevant and could be correlated, but not caused by the cartel.

MR HOSKINS: So the "A" model has to reflect the real world in order to be appropriate; is that -- again, just the lawyers dumbing down, but is that a reasonable --

PROFESSOR BREEDON: It is difficult because clearly, you know, in limit, only the real world can have -- can be a model of everything in the real world, so clearly a model is always going to be a -- a representation that tries to pick out the key features, it cannot simply include every possible variable that could be important, because that is -- well, that is not really even feasible.

MR HOSKINS: But you have to have regard to the real world in order to design your model -- (overspeaking) -- variables.

PROFESSOR BREEDON: Exactly.

MR HOSKINS: And then, paragraph 98, Professor Bernheim tells us:

"Second, when possible, one should avoid including explanatory variables that were under the control of the FX cartels and/or influenced by the cartels' operation to significant degree."

And I think you have already said that you agree with that. That was one of the examples you gave, yes?

PROFESSOR BREEDON: Yes, precisely.

MR HOSKINS: And is that likely to be an issue in the present case? Is this the sort of issue we expect to grapple with?

PROFESSOR BREEDON: Well, clearly, we hope not in the sense we hope to avoid the bear traps that are potentially there, but I think there are some -- already some issues that have -- we've been thinking about -- about in terms of this endogeneity problem, and -- so, you know, but it is -- so we will attempt to avoid it as it arises and certainly consider it. I think Professor Bernheim wanted to add something.

PROFESSOR BERNHEIM: Yes, is my ... yes, my mic is on.

I just wanted to give an example that came up this morning. There was a discussion at some point -- and I forget who specifically was involved in the discussion, but there was a discussion about including measures of adverse selection, adverse selection risk in the model. Now, if the cartel is driving up adverse selection risk and you control for adverse selection risk, you are using the model to take out part of the effect of the cartel and that is the kind of thing that you have to guard against.

MR HOSKINS: And in terms of identifying these sorts of risks, you refer to -- back to the real world, this is where you are looking to the industry research and the academic literature in order to decide where these bear traps are; is that how it is done?

PROFESSOR BREEDON: Is that me?

MR HOSKINS: Sorry, I think you can assume the questions are for Professor Breedon, unless --

PROFESSOR BREEDON: Okay.

MR HOSKINS: -- (overspeaking) --

PROFESSOR BREEDON: Yes, I think that particular -- particularly that issue of variables that are caused by the cartel, clearly, you know, that is where a good theoretical structure helps because it allows you to identify the channels you are looking for to help them to work. So I think that is -- yes, that is an important element of this.

MR HOSKINS: But that is by reference to the real world, by reference to the industry research and the academic literature?

PROFESSOR BREEDON: Yes, yes.

MR HOSKINS: It has to be informed by something, yes?

PROFESSOR BREEDON: Yes, we do not make up theories completely out of thin air, that is right.

MR HOSKINS: No. There is probably an economist or a lawyer's joke somewhere in there!

PROFESSOR BREEDON: Yes, exactly.
MR HOSKINS: You said you have been looking at a number of these sort of potential issues and Professor Bernheim's identified one. What sort of other potential issues such as this might arise in this case?
PROFESSOR BREEDON: This is a little bit complicated and we will probably come back to it later, but you have already, I think, picked up this issue of the booking time problem, that the trades are not necessarily booked at the moment they occurred and that is -- you know, that is a general problem and you discussed some of those this morning.

There is a particular problem if the trade actually occurred after it was booked. Now, admittedly, that is a slightly unusual circumstance, but it could happen. So let us say, by mistake, you know, the dealer books a trade and it has already occurred some time before. Then the price that the trade was done at is -- it was actually observed by the -- by the trader before it happened, if you see what I mean. It was already -- it is what is called "endogenous", that the customer, in fact, was aware of that price before it happened. So when we try and calculate the spread we are using a mid-price and the mid-price was actually a price that the customer could have actually observed, and when you do that, you basically say that the customer could have reacted to that price and that could have caused the trade. So now, instead of the problem -- you know, the assumption we make, which is the trade causes a price effect, now we have got a situation where the price is causing a trade, and that is an endogeneity problem that, you know, again, we have, sort of, been thinking about and grappling with.

I apologise I have taken you down a little bit of a -- of a rabbit hole there, but you did ask for an example and that was the one that has been on my mind.

MR HOSKINS: No, you can blame me for all these rabbit holes.

I think, from what you have said, you have not yet identified a complete list of potential endogenous factors, that is something that would have to be carried out -- carry on after certification; is that fair or ...

PROFESSOR BREEDON: I would not put it that way. What I would say is, you know, we need to know what data we have available in order to structure what we are doing. So, I think we sort of are aware of where these traps are, and indeed, we've been thinking through them, but clearly the structure of the model will -- you know, is not set in stone yet because we do not know what data we will be working with.

MR HOSKINS: And when one has these sorts of endogenous factors, how do you deal with them?

PROFESSOR BREEDON: Okay, we may be going down another rabbit hole here.

MR HOSKINS: Let me see -- because I think one of the ways, and it may be the main way, just to try and help you, I do not want to have you disappearing down rabbit holes all the time, is by use of proxies, and I think that is what Professor Bernheim tells us, at paragraph 99 of his report. So if you want to look at paragraph 99, if we can turn the page, please {MOH-H/0/37}. So if you could read that and if you could tell us if you agree with what Professor Bernheim says there in paragraph 99?

PROFESSOR BREEDON: Yes, so this is actually the rabbit hole I was going to go down, so that is good.

So there is a whole important set of tools called "instrumental variable estimation" where you sort of know the variable you'd like to use is endogenous, but it has got some useful information in it, and therefore you need to strip out the endogenous bit from the variable, and you use these proxies, in a sense to -- you know, as instruments that basically allow you to just retain the non-endogenous part of the information in the variable you are using. So it is a -- it is a technique and I do not think we are going to be necessarily using them in this case, but it is a technique that allows you to, even if you have got an endogenous variable, you can still use it through the use of instruments, and maybe Professor Bernheim might want to explain that better than I did.

MR HOSKINS: Professor Bernheim does want to say something, sorry.

PROFESSOR BERNHEIM: Yes. So, Francis is absolutely right that if you use an instrumental variables estimator, there is a body of econometric theory that says that, you know, you get accurate answers by including the endogenous variable and then doing what is called "instrumenting it".

Now, it turns out, if you are not interested in the coefficient of the variable that you are instrumenting -- which in this case we are not, we are really only interested in the effect of the cartel -- in that case, what you get from instrumental variables becomes equivalent to simply substituting the instrument for the measure that is endogenous. This is what is called the "reduced form" of the equation. So you can think about the use of proxies here as having a formal justification in the instrumental variable literature where it is interpreted as estimating these, what are called, "reduced forms", and as I said, that has a --

that has a solid theoretical econometric foundation.

MR HOSKINS: And Professor Breedon, we have looked then at the use of proxies for dealing with endogenous factors. Are there other situations in which one would use proxies in an econometric model and what would those be? Obviously, I am thinking particularly about this case rather than just a sort of -- (overspeaking) --

PROFESSOR BREEDON: It is difficult. I mean, it really depends what your -- sorry, this is not a great answer. It depends what you mean by a proxy. I think what you are thinking about by a proxy is something that is not precisely the variable you dream of to use in that regression is I guess what you are thinking of.

MR HOSKINS: The way I put it this morning, and I got push back from Mr Ramirez saying, "What do you mean by proxy" --

PROFESSOR BREEDON: Sorry.

MR HOSKINS: -- it is wherever you have to put something in the model which is not simply drawn from a measurement in real life.

PROFESSOR BREEDON: Oh, okay.

If I said, you know, there will be cases where you could say, you know, "My dream variable is X, but I am going to have to use Y which is closely related to X", then I think in that situation that will arise, yes.

MR HOSKINS: And what sort of -- in this case, can you already think of examples where one might have to use proxies rather than -- (overspeaking) -- (inaudible)?

PROFESSOR BREEDON: So, for example, I think one of the things we would like to do is test the extent to which the overcharges related to the, you know, how active the cartel was at various times, and what -- we will not -- you know, how active a cartel is is a variable we cannot directly measure because it will be open. So, let us say we use something like the number of messages in the chatroom, that would be a potential proxy for the intensity of communication between the cartel members, but it would not be a direct measure because they could just be talking about anything or, you know -- so it will only be a proxy for that.

MR HOSKINS: And if we go back to Professor Bernheim's report, at paragraph 101, he says:

"Third, explanatory variables should account sufficiently for the main factors that determine bid-ask spreads, so that any remaining magnification of the spreads is attributable to the cartel."

Again, do you agree with that?

PROFESSOR BREEDON: Yes, although I think there is an additional factor, which I think we will probably talk about later is, where there is in this case you have a great deal of data, you know, that actually, you can get very precise estimates, even if you have not explained everything that is going on. But I think that is -- I mean, that is, again, a probably unnecessary comment.

MR HOSKINS: And then, if we can go to Professor Bernheim's second report, so I need to go to {C/2} -- (overspeaking) --

PROFESSOR BREEDON: Sorry, I think Professor Bernheim --

MR HOSKINS: Sorry, Professor Bernheim, someone will shout and give me a kick -- (overspeaking) --

PROFESSOR BERNHEIM: It was while you were looking down.

No, I just wanted to elaborate on that slightly so that there is no confusion. In the excerpt from my report that you just read, it should not be interpreted as meaning that it is therefore necessary to include all factors in the regression. In fact, there are many situations in which that is not true. It is sometimes the case that when, for example, important factors are correlated with each other to a high degree, the controlling for one of them and not controlling for both actually gives you more accurate estimates.

So I just want to make sure that we do not slip into the confusion that often arises in these cases that a good regression model needs to control for everything.

That simply is not true.

MR HOSKINS: I can assure you we are not in that world and indeed you have made that point very clearly in your other reports, Professor Bernheim, so we are ad idem on that.

So the reference I needed was {C/2/32}, which is Professor Bernheim's second report. This is in the context of the discussion about the alternative approach. So:

"Respondents describe the use of a prediction model as an 'alternative approach' and assert that I have not formulated 'a methodology by reference to that type of model.'"

I just want to leap to the final sentence, which is:

"For example, a prediction model draws on the same set of explanatory variables as a model with fewer dummy variables, and uses the same data."

Do you agree with that as a description of -- as a sort of high level description of a prediction model?

PROFESSOR BREEDON: Yes, as a high level description, yes.

MR HOSKINS: I would like to move on to a different topic. I need to go to {MOH-B/6/2}. Hopefully this is a document you have seen before, because it is your letter of instruction from Scott+Scott, yes?

PROFESSOR BREEDON: Yes.

MR HOSKINS: Paragraph 1.4 says:

"We have provided you with a copy of paragraph 7.67 of the CAT Guide to Proceedings, Part 35 of the Civil Procedure Rules, Practice Direction 35 and the Civil Justice Council's 'Guidance for the instruction of experts'. Please review these documents carefully as they detail the duties that you, as an independent expert, have to the Court."

I just want to confirm, you received copies of those documents?

PROFESSOR BREEDON: I did indeed, yes.

MR HOSKINS: Can I go to {MOH-B/0/90}, your own first report, paragraph 9.8:

"I have endeavoured to include in my report those matters, of which I have knowledge or of which I have been made aware, that might adversely affect the validity of my opinion. I have clearly stated any qualifications to my opinion."

I just wanted to confirm whether you understood that that is a continuing duty that continues throughout your --

PROFESSOR BREEDON: Indeed, yes.

MR HOSKINS: -- involvement in the case.

Again, I assume it is obvious, but I will ask the question, you understand that part of the function of this hearing is for the Tribunal to choose between Mr Evans' application and Mr O'Higgins' application and you are part of that beauty parade, yes.

PROFESSOR BREEDON: Yes, indeed. Yes, I put on my tie especially.

MR HOSKINS: I am going to give you the same chance as I gave Mr Ramirez, because that is only fair, because obviously one of the concerns is for all sets of experts to say, "Yes, we can do this". But another aspect of the suitability of an expert is, "We can help the Tribunal because, where there are difficulties, we will identify them and we will explain how we intend to deal with them". That is part of an expert's function, yes?

PROFESSOR BREEDON: Yes.

MR HOSKINS: So if we go to -- sorry, so, it is the same document tab, it is page 66 of this document {MOH-B/0/66}, so still in your first report. You have a section, "Estimating impact of the Cartels", and as you explain at paragraph 6.43:

"Below I set out in general terms how my model would be applied."

You then have three paragraphs explaining your proposed approach to regression analysis to the Tribunal. I make those paragraphs 6.45, 6.46 and

6.47, and I understand that is obviously a high level indication, but you do not identify any potential difficulties with constructing a liable econometric model in this case in your report, do you?

PROFESSOR BREEDON: No. No, not that I recall.

MR HOSKINS: So this is the big opportunity. I mean, what are the potential difficulties that you anticipate? You said you have been having discussions with Professor Bernheim, I am sure you did not just sit down on the first one and say, "It is easy" and you got out the fag packet and wrote it down.

Help us a bit, what are the potential difficulties that one might -- (overspeaking) --

PROFESSOR BREEDON: Okay, so I think one -- actually, one which I have already mentioned which is this booking time problem that, I have to say, was -- I sort of thought would come up, but is coming up -- when we look at these data sets, is coming up increasingly that is going to be, I think, very difficult to integrate anonymised datasets with -- with the defendant dataset, because what is going to happen, it seems, bizarrely, for every dataset, is that the booking times of trades are slightly different.

So, when you say, you know, I am going to look at the EBS dataset and try and match it with the defendant dataset, you are going to find that that is not possible and that is, you know, limiting the extent to which you will be able to extend the data to other datasets. So I think what it sort of means is, if -- you know, whereas you may dream of using a lot of third party data, my increasing feeling is probably the only source that will be useful is going to be the data from the US case, which will be not anonymised.

So I think -- now, it turns out -- and, again, the realised spread has a sort of double benefit because it is robust to this problem, but it does mean that we are going to have to be careful about these time windows in the way that has been discussed already in this -- in this report, because the time windows will be doing double duty, they will be not only trying to measure price impact, but they will also be allowing for booking time problems. I think that is -- luckily, the sheer volume of data we will have should make that a problem we can deal with, but it is an additional problem that I did not really envisage at the beginning of this process.

MR HOSKINS: Then, the others?

PROFESSOR BREEDON: I mean, other than the general ones that, you know, it is obviously always difficult to -- you know, to estimate the model you hope to estimate and you -- you may make -- may not be able to get all the series we need, but it is very hard to predict what those are ahead of time.

MR HOSKINS: Can we go to page -- sorry, we are still on page 66, so paragraph 6.45. You say:

"The following is a non-exhaustive list of potential controls which may need to be applied in both the Cartels Period and the Clean Period."

I just want to check, do you agree that there are many different factors that are likely to affect bid-ask spreads? I am not at this stage asking about the choice of explanatory variables, I am upstream from that.

PROFESSOR BREEDON: Yes, indeed, although, you know, obviously the ones that are of key importance are the ones that may or may not be correlated with the cartel, so those are the ones we really need to track down. The other ones are nice to have, but they do not cause you any problems in estimating the (inaudible).

MR HOSKINS: But you have to identify the potential drivers of the -- (overspeaking) --

PROFESSOR BREEDON: Yes.

MR HOSKINS: -- (inaudible) and then you have to identify the ones that are correlated, yes?

PROFESSOR BREEDON: Yes.

MR HOSKINS: You identify ten potential controls in paragraph 6.45. How did you produce this list?

PROFESSOR BREEDON: I am afraid, like everybody, from the literature.

MR HOSKINS: And why do you say it is a non-exhaustive list?

PROFESSOR BREEDON: Because I didn't want to put myself in the position of, you know, of wanting to add things or indeed take things away (a) as the data -- you know, as we get to see the data, and (b) indeed as my understanding of what is going on improves. So in a sense, what I was trying to do here was -- it was really just saying, these are examples, and maybe that is not as precise as I should -- I could have been, but I thought at this point, there was no point trying to say I could -- I could, you know, confidently say what variables I needed.

MR HOSKINS: I would like to take you back to Professor Bernheim's first report, so we need to go to {MOH-H/0/45}, and you will see the heading, "Explanatory variables". This is the section of Professor Bernheim's first report where he considers potential explanatory variables. Again, I just assume you have read this section before?

PROFESSOR BREEDON: Yes.

MR HOSKINS: And if we can go to paragraph 128 on

{MOH-H/0/46}. In paragraph 128, my understanding is you will see it at the introductory sentence, he lists ten potential explanatory variables relating to the general aspects of the market; do you see that?

PROFESSOR BREEDON: Yes.

MR HOSKINS: And then at paragraph 129 on page {MOH-H/0/47}, there he lists seven potential variables relating to the characteristics of particular trades, yes?

PROFESSOR BREEDON: Yes.

MR HOSKINS: And then over the page again, page 48 {MOH-H/0/48}, he lists three further potential variables relating to customer characteristics; you see those, yes?

PROFESSOR BREEDON: Yes.

MR HOSKINS: Again, just to check where you are in terms of your analysis with Professor Bernheim. Do you agree that these are all potential explanatory variables?

PROFESSOR BREEDON: Not necessarily all there, I am afraid. It is -- and indeed, there may be some on this list that we decide we do not want to pursue, so -- or may not, you know, there may be issues with. So, yes, I think at this stage, you know, it is going to be important to start looking at the data before we really pin down the model, and I am -- I mean, I am sorry if I am being a bit evasive, but I do not want to be in a position where I -- you know I pin my colours to the mast as to exactly what variables we are going to use without actually having seen the data we are working with.

MR HOSKINS: Just to be fair to you and I hope to put Professor Bernheim at some -- (overspeaking) -- these are lists of potential explanatory variables, rather than saying --

PROFESSOR BREEDON: Yes, yes, yes.

MR HOSKINS: -- like you, Professor Bernheim understandably has not said, "These are the variables we are going to use"; they are potentials. This is a discussion, obviously an ongoing discussion that you and Professor Bernheim will have as the case goes on about what are the potential explanatory variables, yes?

PROFESSOR BREEDON: Yes.

MR HOSKINS: And which ones you are going to include in the model; is that correct?

PROFESSOR BREEDON: Yes.

MR HOSKINS: And both you and Professor Bernheim say these are non-exhaustive lists of potential explanatory variables. What other work are you going to have to do to produce a fuller list? What does the work stream look like on this?

PROFESSOR BREEDON: So, as I have said before, I think, with disclosure and with the data, we will suddenly have a whole new vista open up to us in terms of how to analyse this problem, so that will be an important part of the work stream is really seeing what we have got, what we can and cannot integrate in the way I have discussed before, you know, so I think that is going to be an important part of this decision-making process. Indeed, as you estimate you learn, and I would say I am sort of hoping that we can -- and I am not sure whether this is officially the way it works, but, you know, we can show you some of our workings as we go along because it is important that we do not just come up at the end and say, you know, "The answer is 42", that we do show the process that got to that.

I think Professor Bernheim has a point.

MR HOSKINS: Thank you.

PROFESSOR BERNHEIM: I just wanted to jump in on one thing that may be a minor detail, but it is important and it does resonate with what Professor Breedon just said. Mr Hoskins, you used the word "model" singular. This will most likely be an analysis that involves models plural. That is the way these sorts of analyses usually proceed. We would investigate and probably ultimately present a collection of models, and that is important because one has to explore which models -- model or models are most reliable and there are well accepted statistical procedures and criteria for judging which of the models is performing the best for our purposes. So the idea would be to explore robustness and not simply hang our hats on a single model, and that, you know, resonates with what Professor Breedon was just saying, because that reflects the process of exploration.

MR HOSKINS: That is understood, and whenever I use the word "model" I am quite happy for people to assume that we should read it as "models" for precisely the reason you have said. It is simply shorthand on my part, but I am very happy for you to make that point.

So one of the things that is going to help advance the work is the data. Is the literature exercise finished or is that an ongoing process as well?

PROFESSOR BREEDON: It is an ever ongoing exercise. Literature is always growing, although I would say, you know, although it may not be completely obvious, the sort of tools we are using in this case are really pretty basic building blocks of the literature, you know, these are almost the foundations of the literature. We are not really at the cutting edge in what we are doing here.

MR HOSKINS: Well, you are at the cutting edge in one sense --

PROFESSOR BREEDON: In data sense. In data sense, we are, yes.

MR HOSKINS: In data, but also in the sense that, there are obviously different bits of the literature which deal with different aspects of the market, but as far as I am aware, nobody yet, even in the literature, has taken all the bits and put them together into, you know, the sort of model we are looking for. That has not been done yet, has it?

PROFESSOR BREEDON: You are an empiricist, like me. You just say, you know, "I am original because I have a better dataset", but I am afraid the theorists say -- slightly disagree and say, you know, what we do is very basic, we just test basic theories using large -- large amounts of data.

MR HOSKINS: Yes, but nobody -- nobody in the literature --

PROFESSOR BREEDON: Nobody has done it yet. No, exactly. This is a great dataset and this is going to be a great empirical exercise.

MR HOSKINS: Yes. Can we go to -- I will short circuit it. In your second report, you refer to a recent paper by Ranaldo and Somogyi, do you remember that?

PROFESSOR BREEDON: Yes.

MR HOSKINS: I want to take you to that paper. That is at {C/1.4/1}. This is going to give me nightmares tonight; it is going to keep me awake, these references! So you see, that is the article that you refer to in your report.

PROFESSOR BREEDON: Yes.

MR HOSKINS: And if we could go through please to page 4 {C/1.4/4}. The introduction:

"One of the most important questions in financial economics is how security prices are determined. This is especially true for the foreign exchange (FX) market, which is the largest financial market in the world, with an average daily trading volume of $6.6 trillion ... since it is almost entirely an over-the-counter (OTC) market, FX trading activity is relatively opaque and fragmented. Without a centralised trading mechanism, information is dispersed across various types of market participants such as commercial banks or asset managers, which maintain heterogenous relationships with another. All these participants possess distinct information sets and may contribute differently to FX determination."

And then it explains what the purpose of this paper is:

"The contribution of this paper is to uncover how different market participants determine currency values and to substantiate that asymmetric information risk is priced in the global FX market."

So just to see if I have understood the basics. We know, we all agree there are lots of drivers of the bid-ask spread. The market is opaque and therefore it is not a case where you can simply, you know, like for a widget manufacturer, you say, produce your accounts and you identify the costs. The reason why we have this very rich and developing source of literature is precisely because the market is opaque. What a lot of the theorists and empiricists are trying to do is to look beyond that opaqueness and to identify what the drivers are and how they relate to each other; is that a fair description of it at high level?

PROFESSOR BREEDON: Yes, although I am going to make a point because this came up already this morning --

MR HOSKINS: It did, yes.

PROFESSOR BREEDON: -- and I slightly disagreed, which -- so, you know, if I went into the FX market and tried to deal, you know, it would be very opaque and I would -- you know, I would not have a clue, you know, it would be very -- there would be all sorts of people who have a big information advantage over me. However, you know -- and this goes back, I am afraid to, my excitement about the data, I guess, you know -- in this case we are going to, you know, potentially receive a dataset of transactions which is the most -- I think probably the largest and certainly the most comprehensive that has been used in any transaction study across any market. So, I think, where I would focus the opacity is, you know, if I am the poor customer attempting to deal, then the market looks very opaque to me because there is all sorts of stuff going on. As, we as -- looking at the data, we -- that opacity, you know, we get to look through the curtain because we get to see the details here. So I think the opacity is really more from the perspective of the customer, not from the researcher, so I think that is -- so I make that distinction and I think Professor Bernheim might want to add to that.

PROFESSOR BERNHEIM: Yes, I just wanted to add that, you know, you have posed the question from the perspective of research on foreign exchange. From the perspective of anti-trust economics, from the perspective of thinking about how cartels work and the issues that usually come up in cartel cases, it is not uncommon at all for parallel issues to arise, issues about opacity of pricing, because, you know, you think about the typical intermediate goods market. There may be posted prices, but transaction prices are negotiated between a particular seller and a particular buyer on a case-by-case basis, and nobody sees the prices that others are actually being charged. That actually is a fairly common occurrence that we see arising in a variety of cartel cases. I have certainly seen it in cartel cases that I have worked on.

So I just wanted to flag that, you know, the issue of customer opacity of the market is not something that is out of the norm for dealing with in cartel cases.

MR HOSKINS: I think this discussion is very helpful because I think we may be at slightly cross-purposes in the sense that where I am talking about opacity and the way I understood it from this article, for example, it is not simply about the customers dealing with each other in terms of what they see, I am using it in a different sense and that is almost certainly my fault rather than either of your faults, which is that we started with, the analysis has to identify the potential drivers of the bid-ask spread, you then have to identify what the potential explanatory variables are, you then have to pick your variables. So the process I am describing as opaque -- and I should not use that word, I simply make the point that, again, there is not a simple toolkit you go to which gives you the answer for, here are all the drivers, here are all the potential explanatory variables, here are the ones you must use in the model. You will obviously get a lot of information from the data. As we have already established, that is not the sole repository, you will also have to look at the literature and you will also have to look at the business evidence. Is that a fair summary of the exercise we are embarking upon?

PROFESSOR BREEDON: Yes, I think up to the point of saying that it is -- sorry, as I said before, you know, we are doing something pretty theoretically basic here, so it is -- so it is not as if we are developing something, you know, highly complex in terms of structure, it is really, in a sense, going back to the point I made before, it is really just the -- I mean I think the word you may be looking for is -- within that sense is, you know, the heterogeneous element that we have a lot of very different types of players in this market and that is -- and that will -- that is an issue which will make -- you know, as to the issues about variable selection. So I would -- I think that maybe that was your point about just that, you know, the rich tapestry of different types of customers we have got in this set up.

MR HOSKINS: I think Professor Bernheim may have his hand up again, I am not sure if it is left over from --

PROFESSOR BERNHEIM: No, I quickly put it down and then raised it.

The -- still your reasoning, as this morning when you posed similar questions, seems to be that what is referred to here as opacity somehow makes it difficult to figure out what matters in this market, and I do not really see that, honestly. I see the issue of the market being non-transparent to its participants, but so far as the task of the economic analyst goes, I do not see these issues as necessarily making the task more opaque for us.

MR HOSKINS: I understand.

Can I go to {C/1/27}, which is Professor Breedon's second report, and at paragraph 3.45, you list the potential explanatory variables that the banks have identified, because everyone in this case has had a go at saying here are some explanatory variables and we identified some as well.

Then at paragraph 3.46, so over the page, please18 {C/1/28}, you say:

"As set out in more detail in Professor Bernheim's Response Report, these factors ... need to be controlled for if one believes that their variation is correlated with the effect of the Cartels, (ie the fact that a factor has changed over time does not in and of itself mean that that factor needs to be controlled for). Alternatively, these factors may be adequately proxied for using available data."

I wanted to ask, have you actually done any work yet to assess whether there is any correlation between the factors identified by the banks and the effects of the cartels?

PROFESSOR BREEDON: I think as I have mentioned in one of my reports, I have estimated some realised spreads in FX, but it involves confidential data, so I do not really -- again, sorry, I do not really want to say very much more about that.

MR HOSKINS: Okay, but if we were -- I mean, for example, I am not suggesting we do this, if we were to go through each of these factors, could you tell us today whether there was a correlation between that factor and the cartel -- (overspeaking) -- or is that a work in progress?

PROFESSOR BREEDON: That is -- yes, and also -- I am very nervous that I will get myself into trouble if I say -- you know, I will need somebody to prompt me what I am allowed to say on these matters. I am sorry.

MR HOSKINS: The question is, is it a work in progress, so --

PROFESSOR BREEDON: It is a work -- well, yes, it is a work in progress, yes.

MR HOSKINS: And have you done any work to assess whether these factors may be adequately proxied for using the available data that you have at the moment? Or work in progress?

PROFESSOR BREEDON: Yes, let us just leave it at that -- sorry, I am just nervous because I have been -- you know, I have been brow-beaten on this subject and I got as far as to say I could mention I have done -- I have estimated real estimates before, but I do not want to get too far into the -- into the nature of what I have done and so I apologise for that.

MR HOSKINS: So you have not reached a conclusion on whether you could proxy for each of these if necessary?

PROFESSOR BREEDON: Certainly the work I have done would not tell me what I can do with this particular dataset and what will work in this approach, so it is not a -- you know, it certainly has not taken me to a finalised view of how -- how to proceed.

MR HOSKINS: Thank you very much, gentlemen, for both -- the time you have both given me and I have no further questions, sir.

THE CHAIRMAN: Well, thank you very much, Mr Hoskins. Without further ado, we will move over to Mr Robertson and your cross-examination.

Cross-examination by MR ROBERTSON

MR ROBERTSON: Thank you very much, sir. My questions are directed first of all to Professor Breedon.

Now, Professor Breedon, there is no dispute between the two PCRs that the harm caused to customers of banks which were participating in the cartels, in other words, the proposed defendants, and there is no dispute between the PCRs that there would be harm flowing from the cartels which is suffered by customers of the proposed defendants when they are not participating in the cartels and also to customers of other institutions dealing in FX. The differences between the rival PCRs are about how you go about theorising that harm and then going about measuring it.

So we have both got a class of institutions called "relevant financial institutions". They are defined a bit differently, and I would like to explore that with you. They are listed, first of all, in the definitions to your first report, and if we take that, that is {MOH-B/0.1/10}. This is actually your amended first report because it had to be quite substantially amended once you got hold of the decisions. We see there that there is a definition of "relevant financial institutions", and then you list a whole range of institutions. You explained how you defined them at paragraphs 4.28 to 4.30. That is at page {MOH-B/0.1/66} under the heading, "Relevant financial institutions", and in particular you referred to documents where you have identified them at 4.29.

We then see that you set things out in tabular form at 4.29, table 3, {MOH-B/0.1/68}, and that list there are 30 institutions. Your definition lists 39, and it is your definition which is then reflected in the claim form. So if I can just turn to the re-amended collective proceedings claim form, which is in {MOH-A/0.1} again, because it is the -- and this is the -- I should correct myself. This is the amended collective proceedings claim form, this is not the current version, it is the one -- it is the first iteration that was amended to reflect the information that came out of the Commission decision. If we turn to page {MOH-A/0.1/21}, then we can see -- well, actually, if we see the definition at letter F on page 21, and that lists the 39. That then feeds through to the definition of the proposed class, which is on the previous page {MOH-A/0.1/20}, paragraph 33:

"[The class is] those who have entered into one or more Relevant Foreign Exchange Transactions."

That is defined at A as transactions with a "relevant financial institution", so that is how it feeds into the class definition.

Now, I just want to draw a comparison between that and Mr Evans' list of relevant financial institutions so we can see what the differences are and then how the O'Higgins PCR goes about, with your assistance, in resolving the difference. So, this is still scene-setting. I will come to a question in a minute.

So, if we go to Mr Evans' claim form, which is in file {EV/1/25}, and that then sets out the relevant financial institutions relevant to Class B, and it is under the heading, "Class B", in fact, if we turn the page to {EV/1/26}, and referring to transactions entered into with a relevant financial institution, and to find out what a relevant financial institution is, we turn to the class definition, which is at annex 3 to the claim form. That is at {EV/5/1}, "Proposed class definition", you see there Class B, the reference is (a)(1), to "a relevant financial institution".

If we turn to page 5 {EV/5/5}, there is the list of relevant financial institutions and there is 57.

So, if you are starting there from the position of a prospective class member, comparing the two propositions, it looks like Mr Evans has got a much more extensive class of relevant financial institutions, and so, you would ask yourself, well, why is it more apparently comprehensive?

Now --

MR HOSKINS: Is he going to ask a question?

MR ROBERTSON: I am going to ask a question once we have shown how the O'Higgins list of relevant financial institutions was identified, and that is not in your -- directly addressed by you, it is directly addressed by Ms Hollway in her fourth witness statement, which you then refer to in your second report. If I can ask you to turn up your second report, it is in bundle {C/1/40}, and if I can ask you to turn to paragraph 5.8, where you refer to this under the heading, "Non-Respondent Institutions", and you say that this has been addressed by Belinda Hollway in her -- there is a reference there to her third witness statement, but that is an error, it is her fourth witness statement, which is dated 23 April, and you say there:

"In summary, the Evans ... list includes 16 more institutions than the O'Higgins list and, in my opinion, those extra institutions were unlikely to act as active Dealers in G10 currencies."

What was the basis for your opinion?

PROFESSOR BREEDON: So, I think the issue we have in foreign exchange, which is different, for example, than the gilts market, there is not an official definition of what a dealer is, so I could call myself a dealer, or indeed, I could be a dealer and say I am not. So these definitions are hard to work in. So what I am very drawn to in my report, and indeed in the comments I made subsequently, is to try and get as close to -- as I could to what you might call an official list of RFIs and that means that I rely very heavily on the foreign exchange joint standing committee which is not a regulator, but it is the closest thing there is to an overseer of the FX market, and the list of RFIs that I used was their list, and they said that the list is pretty comprehensive and that will cover almost all cases.

So at that point --

MR ROBERTSON: Professor Breedon, can I interrupt you there --

PROFESSOR BREEDON: Sorry.

MR ROBERTSON: -- because I think you are answering a slightly different question. I was focusing on the extra 16. So what Ms Hollway has done is she has looked the difference between 39 and 57 and says, it is not 18 difference because two of them, Adam & Co and Coutts & Co, are part of RBS, and yes, we accept that. So the difference is 16.

And you say:

"In my opinion, those extra institutions were unlikely to act as active Dealers in G10 currencies."

I just want to know, what is -- you do not refer to a document there, you do not refer to a Bank of England survey or FX JSC. So what was the basis for your opinion.

PROFESSOR BREEDON: Well, as I just said, the basis was largely that the FX Joint Standing Committee list did not include these and therefore -- and when we discussed this list with them, they said that they -- because the list that the evidence group have was the list of FX dealers and interest rate derivative dealers, that their suspicion was that this -- that the actual ones on the list were actually interest rate derivatives dealers. They did not -- I did not confirm that, they did not say that as a certain fact, but you can see how my logic went. I discussed it with the data providers and they said that their -- that they were tempted by the view that it was -- that the extra ones were actually interest rate swap dealers and the one that, obviously, clearly, you know, raises the alarm bells is Nationwide Building Society, which nobody I do not think can say is an FX dealer. So that is why -- it is true that I did not do -- you know, other than speaking to the statisticians at the Bank of England, I did not do an exhaustive bit of research, but that was the basis on which I made that comment.

MR ROBERTSON: So why is this not explained in your report?

PROFESSOR BREEDON: Well, as I say at the beginning, you know, I think we can both agree that we have 99% crossover between our lists, and indeed, if you drop some off the list, it is a double edged sword. So they can no longer be a customer, but if they were a dealer, that means that their customers are no longer members of the class, so actually, the difference it makes to the -- to the calculation is absolutely minimal. So I have to say --

MR ROBERTSON: Professor Breedon --

PROFESSOR BREEDON: Sorry.

MR ROBERTSON: -- sorry to interrupt you. You are going ahead of me.

PROFESSOR BREEDON: Sorry, I thought as you asked a long question I would give a long answer, but that was obviously not the case.

MR ROBERTSON: No, it is not. I asked why it is not explained in your report. It is not explained in your report.

PROFESSOR BREEDON: Because I thought it was de minimis so I did not think it was something that was worth writing about.

MR ROBERTSON: Okay.

So if I look at Ms Hollway's statement, which you do cross-refer, that is in {D/3/30} where she addresses this issue, and she gives an explanation as to why -- as to what investigations she has carried out. She refers on page {D/3/31} at paragraph 92 to a call between her colleague Mr Mansfield, two people from the BDO and the Bank of England. You did not take part in that call?

PROFESSOR BREEDON: Not that particular call, no.

MR ROBERTSON: So that is what she gives as her source of information, and she says there:

"The banks listed in that survey [to which you refer] are not categorised as being FX or derivatives traders, so it is impossible to determine if such banks would be market makers in both FX and OTC derivatives."

So, that is not you investigating it, it is Ms Hollway investigating it?

PROFESSOR BREEDON: On this call, yes.

MR ROBERTSON: Well, did you have any other call?

PROFESSOR BREEDON: Well, as you may have seen on my CV, I did work in the Bank of England and I spoke, admittedly briefly, to somebody who was involved in this data, but it was not -- this was a more detailed call than the conversation I had, so I will not go further into that conversation.

MR ROBERTSON: There was not a conversation you thought worthy of recording saying -- (overspeaking) -- I have also checked this out informally and I agree with Ms Holloway.

PROFESSOR BREEDON: Yes, no, as I said, because I consider this really a de minimis issue.

MR ROBERTSON: Did you ask Mr Reto Feller about this issue?

PROFESSOR BREEDON: Not that I can recall, no, because I think as I tried to explain at the beginning, I am really drawn to a list that has some, you know, official stamp on it, however minimal that official stamp is, and I think what I do not want to do is get in the business of, you know, asking my friends and relations who they think FX dealers are. So -- so I think that was -- (overspeaking) --

MR ROBERTSON: Sorry, Professor -- (overspeaking) --

PROFESSOR BREEDON: -- always the core of my analysis was really I wanted an official list, I didn't want an insider's list or anything like that, so I mean -- sorry, I do not mean insiders in a pejorative way, I mean, you know, somebody who, even if Reto would know a lot more about who he has dealt with in the past etc than I would, because I obviously only had a few years' experience on a trading desk. But, you know, it is -- that was not the -- I didn't want to have a list that was -- that was just a list that was created by asking around because that would -- to me felt a rather -- well, I mean, I am not a lawyer, but it felt to me a legally rather dangerous route to go down.

MR ROBERTSON: So in that case Professor Breedon, why did you ask your friend at The Bank of England.

PROFESSOR BREEDON: Because he was involved in creating the official data, so he was involved in the Foreign Exchange Joint Standing Committee. It was only to confirm what happens in this conversation.

MR ROBERTSON: But it was not worth putting in your report?

PROFESSOR BREEDON: No.

MR ROBERTSON: Then if we return to your report, page 41, paragraph 5.9. You say:

"Nevertheless, I consider this issue as one that is ultimately for the Tribunal to determine in due course."

So it is not for you to get to the bottom of, the Tribunal can be left to do that?

PROFESSOR BREEDON: Well, what I didn't want to do, because -- (inaudible) -- I wanted to use an official list and I think I do not know that this is necessarily the best official list, and indeed I am not even sure of the approach. I mean, I -- I would like to use an official list, but I think if the Tribunal said, you know, "This is not close enough to what we want you to analyse", I would be happy to try and take a different approach.

So I -- so the point is, I mean, I am not, you know, dying in a ditch and saying the Bank of England list is correct, I am saying the Bank of England list has the big advantage of being official and is -- the coverage is so close to what the true coverage is that it -- as to make really very little difference. But if people think that tiny difference is really worth a different approach, then I -- I mean, I can see that is a reasonable -- I mean, indeed I think that is the position you are taking -- I think that -- you know, that it would be reasonable to say, yes, we can do it by survey, but I -- I am nervous of the process of asking somebody, you know, "Are you a dealer or are you not a dealer", when it actually has a monetary implication, you know, in this case. I would rather say we have taken a list which is -- has some imprimatur on it that means that you do not get to decide whether you call yourself a dealer or not.

MR ROBERTSON: Okay. Well, let us see how the Evans PCR tried to resolve this outstanding issue.

It is addressed both by Mr Ramirez and by Mr Knight. I will deal first with how Mr Ramirez addressed this issue. So, if we can turn to bundle {C/10/15}, which is Mr Ramirez's third report, and he addresses this issue of -- at -- so it is page 15, starting at paragraph 30, the section headed, "RFIs only in the Evans application", and we can see that he gets -- or tries to get to the bottom of this by using Euromoney survey data -- that is at paragraph 31 -- and he points out that it is not just the Bank of England that is a source of data here, or the BIS Triennial Survey:

"... evidence of FX dealer activity can be discerned from our sources. One such source is Euromoney, which conducts annual surveys of the FX market and reports a variety of market share statistics. Euromoney [said that it] ... 'is widely considered the benchmark league table of the FX market'."

On the basis of what is set out in the Euromoney survey, Mr Ramirez explains, at paragraphs 33 and 34 {C/10/16}, that he can identify 11 of the Evans-only RFIs as being FX dealers from the Euromoney survey. Do you agree with him?

PROFESSOR BREEDON: Well, if you take that as a definition of a dealer. As I said, there is no agreed definition of a dealer and therefore we are dancing on the head of a pin, as far as I am concerned, because the Euromoney survey, as I understand it, you self-declare as a dealer and that is one of the reasons why I did not really want to use it. I mean, again --

MR ROBERTSON: What sort of -- sorry, what sort of publication is Euromoney? Is it highly regarded?

PROFESSOR BREEDON: Oh no, it is highly regarded, but the survey -- it is a survey where people self-report, so it is -- so I have an attraction to a survey where a third party has -- has decided, so, you know, it is -- yes, I mean --

MR ROBERTSON: I mean, Euromoney --

PROFESSOR BREEDON: -- you can see -- that is why I said this point about the Tribunal. Frankly, I am not hugely bothered by this issue, so I think, you know, it is not one that will keep me up and night and that would -- and if -- if the Tribunal said, you know, "You should use the Euromoney editions", I would happily include them, but as I said, that -- I think -- hopefully what you are asking me is what my reasoning was for the choice I made, and I have given you the reasoning for the choice I made.

MR ROBERTSON: Well, I am just interested in the thoroughness of your methodology --

PROFESSOR BREEDON: Well, as I said to you --

MR ROBERTSON: Sorry, can I --

PROFESSOR BREEDON: -- (overspeaking) -- it is a question of approach. I wanted an official list, I did not want a self-reported list, and so it is not -- so there is a distinction there I think we need to just draw at this point.

MR ROBERTSON: So when Euromoney say that they are "widely considered the benchmark league table of the FX market", you think that is an unreliable statement?

PROFESSOR BREEDON: Well, (a), as I said, the dealers self-report, (b), much as I respect Euromoney, I respect the Bank of England more highly.

THE CHAIRMAN: Mr Robertson, just so that you are aware of my eye on the clock, I think you should aim to end at 10 to. I appreciate that is cutting your time by some minutes, but Professor Neuberger will have some questions and we will have of course have to have re-examination, which will also be shorter than the half hour laid down. I do apologise, but I think I am going to have to guillotine you at 10 to.

MR ROBERTSON: Very grateful for that indication.

Well, I will just -- I think it is clear that -- and I will just (inaudible) Professor Breedon, you have investigated this as far as your first report and you stick to the methodology in your first report. You have not -- am I correct in thinking that your solicitors have taken this further in response to the criticisms that Mr Ramirez and Mr Knight make when they say that: actually, the 16 extra RFIs, we do recognise 15 out of the 16 of theirs as being FX dealers. That is not something that you have further investigated; is that correct?

PROFESSOR BREEDON: I have investigated it alongside the BDO team, yes.

MR ROBERTSON: Sorry?

PROFESSOR BREEDON: I have investigated it alongside the BDO team. So -- so, the BDO team are the ones I have worked with on this.

MR ROBERTSON: So you have been investigating it?

PROFESSOR BREEDON: Alongside them, yes, but clearly there are calls here that I was not -- as you rightly point out, that I was not present at.

MR ROBERTSON: Well, the latest suggestion that we have, which is in my learned friend's carriage skeleton at paragraph 10.3(a) -- that is {AB/1/6} -- so it is subparagraph (a) towards the bottom which floats a suggestion that the 16 banks include four Chinese banks. Is that something you yourself investigated?

PROFESSOR BREEDON: Well, I did not go to China and ask them. I mean, I think -- so, my understanding was, because we were including derivatives that weren't just spot and forward FX in this list that there would be a number of Chinese banks who were dealers in NDFs that would -- that would get included in a BIS list that would not be in the bank list. I did not investigate these four banks particularly, but that was just a -- again, an assumption that Chinese banks obviously specialise in NDFs -- tend to specialise more in NDFs than -- than spots when they are dealing with international customers.

MR ROBERTSON: So if I take you to the list of banks that we are talking about, it is probably best found at {C/8/5}, and this is Mr Knight's third report and they are set out at paragraph 10. Which of the four Chinese banks that are referred to in my learned friend's skeleton?

PROFESSOR BREEDON: Sorry, I did not really understand the question. Sorry.

MR ROBERTSON: Sorry. There is a list of banks at paragraph 10. You have said that you think these extra banks, the extra 16 include some Chinese banks.

PROFESSOR BREEDON: Yes.

MR ROBERTSON: My learned friend has said there are four of them in his skeleton argument. Are you able to assist me as to which four are being referred to, because it was not particularised in that skeleton.

PROFESSOR BREEDON: Right, I would rather not do this on the fly, if that is at all possible. It is sort of like doing a test -- testing my eyesight. Is that -- is it -- sorry, I -- I --

MR ROBERTSON: So, the point I take from--~(overspeaking) --

PROFESSOR BREEDON: -- (overspeaking) -- not my point to ask -- but I mean, what are you -- what are you really asking here me to read out --

MR ROBERTSON: Well, what I am trying to tie you down on is have you identified for four Irish banks -- four Irish banks? -- four Chinese banks?

PROFESSOR BREEDON: So, I --

MR ROBERTSON: So, have --

PROFESSOR BREEDON: -- me personally, no. I -- as I said before, I -- when I was --

MR ROBERTSON: That's --

PROFESSOR BREEDON: -- talking about Chinese banks --

MR ROBERTSON: That's the thrust of my question.

PROFESSOR BREEDON: -- I assumed that they were likely to be NDF dealers and therefore I lumped them together; I did not individually look at them.

MR ROBERTSON: Professor Breedon, in view of the guillotine, I have got one more topic for you and I am going to ask you some questions about your views on coordinated trading conduct and front-running.

I take it from your first and second reports that your opinion is that coordinated trading could have impacted on benchmark trades, and that is paragraph 6.24 of your first report {MOH-B/0/60}, paragraph 5.5 of your second report {C/3/46}, and you also consider that coordinated trading could have impacted on limit and resting orders, potentially -- it is the same references. But in both of the decisions that these follow-on claims are brought on, the Commission found that coordinated trading only took place on an occasional basis; is that correct?

PROFESSOR BREEDON: Well, I think I prefer the term "recurrent and extensive", but yes, "occasional" will do.

MR ROBERTSON: So, can I take you to the decision in question. Let us go to Three Way Banana Split. It is at -- sorry, beg your pardon, I have got the wrong bundle here. So it is {EV/2/14}, and you go to the heading of -- above paragraph 60 at the bottom, 4.1.2.3, "Occasional instances of coordination facilitated by the exchange of information", so it is not "extensive and recurrent", it is "occasional".

PROFESSOR BREEDON: I think there is another phrase in the document here, but let us not get into that.

MR ROBERTSON: Okay, I am not going to take you into the decision, we will leave this as a matter for submission.

PROFESSOR BREEDON: I mean, it is not relevant in the sense that I think -- and actually this is a good point, because this came up in the previous evidence. I mean the fact that it is occasional still means that it passes through to have a permanent impact on spreads, and I was trying to think of a good analogy. So it is like saying, you know, if somebody comes -- you know, you have got a shop and every -- at an unspecified time of the day, somebody comes in and steals £1,000 from you, how do you get that £1,000 back? You do not go to the next -- you do not ask the next customer, "I have just been robbed, can you pay me the thousand I have just been robbed", you raise all your prices a little tiny bit in order to recoup the money that you lost on that -- on that -- when you were basically robbed by -- you know, whatever basis, and therefore the adverse selection is coming through in every trade that happens, and even, actually, because, after a bit, the person expects to be robbed, their prices are permanently raised.

So even though these things happen occasionally, they end up having a permanent effect on spreads, because the person -- the -- in this case what I would guess, you know, the non-defendant dealers, will have this problem where they are trying to recoup the occasional losses just in the course of their normal business and they will not be able to recoup it all from one customer, they are recouping it from a general increase in spreads that they then apply to at all trades. So that is -- because I think this came up before, that is how what appears to be temporary and transitory effects translate into a permanent effect on spreads.

MR ROBERTSON: Thank you, Professor Breedon. We will save our comment on that for submissions in due course.

In the five minutes left to me I would like to turn next to the significance of benchmark trades and resting orders for the proposed class members. Now, it is correct to say that you have not estimated the volume of commerce attributable to benchmark trades, have you?

PROFESSOR BREEDON: No.

MR ROBERTSON: You have not estimated the percentage of volume of commerce accounted for by resting and limit orders, have you?

PROFESSOR BREEDON: No.

MR ROBERTSON: Benchmark trades and resting orders are likely to be a relatively small percentage of the overall volume of commerce, aren't they?

PROFESSOR BREEDON: Yes, although, if I can add something, they are particularly important in this case because that is where the harm is being done into those types of trades. I think Mr Knight made a really important point earlier about -- about resting orders. He said that a dealer might be prepared to charge a zero spread for a resting order because of the information it contains. So, effectively what -- you know, this is the important part of the -- of the process.

Resting orders are particularly valuable to -- in markets because they -- they are not like a normal market order where you do not know whether the person is a buyer or a seller until the last possible moment and then you have to trade. A resting order gives away, you know, all the information about a trade. You have said, "I am going to do it later, so I am giving you fair warning I am doing this trade, and I am telling you I am a buyer or I am a seller", and so these are real, you know, nuggets of information in the market, and therefore, whilst the volume of commerce might be relatively small, we do not know -- I mean, we can try and estimate, we don't know -- the damage which is to the benchmark and the resting orders I would expect to be more significant because basically the customer has given away more information in those trades than they would have done in a normal market order.

MR ROBERTSON: Well, you have not done the estimations for volume of commerce or for damages.

PROFESSOR BREEDON: I really do not think that would be possible until we -- until we start estimating, because indeed, you know, if we are in the situation, which we are likely to be, where we cannot identify resting orders separately in the dataset, we will never know what share of the damages is due to resting orders.

MR ROBERTSON: So, ultimately the only expert before the Tribunal so far who has had a first run at estimating, even on a very preliminary basis, is Mr Ramirez, and he breaks it down into an estimate for 3% VoC for benchmark trades, 5% for resting orders. Now, you have got no reason to doubt those estimates?

PROFESSOR BREEDON: Not at this stage, no.

MR ROBERTSON: Sir, I finished two minutes ahead of time.

THE CHAIRMAN: Well, I am very grateful to you, Mr Robertson. Thank you very much.

What we will do is, I am going to hand over to Professor Neuberger now and then we will take a break, if we have time, before the re-examination.

So, over to you, Professor, if that works.

Questions from THE TRIBUNAL

PROFESSOR NEUBERGER: Good afternoon, Professor Breedon and Professor Bernheim.

I assume you have both heard the earlier discussion with the experts on the other team. Can I just, therefore, go quite quickly over some of the general points which I think are common to both teams.

The first was that your case theory, like theirs, explains how damage could be done, both immediately and to a variety of connected trades in other markets with other dealers, in other sizes, in other currency pairs, and the point I confirmed, I think, with Professor Rime was that the question of whether this damage was actually material in each case would be an empirical matter which would come out of the regression, and therefore the implication of that was that if regression was done for some particular class or sub-class and showed no significant spread difference between the clean period and the cartel period, then the natural inference from that was that those people should be not part of the class that ought to be compensated for the cartel.

Please.

PROFESSOR BERNHEIM: Okay, if I could jump in on that. One has to be careful about this because in any estimate there is statistical noise, there is -- you know, there is measurement error in the statistical estimate, and we know that that has some distribution.

So, if someone were to chop the class up into a hundred different categories and estimate several effects for every one of those categories, simply by chance, some of the distribution is going to show no effects, and that does not mean that the real effect was not there, it means that you have a distribution of estimates. So, that is the one thing I just want to -- you know, on these kinds of issues where you have many effects, people often make mistakes on statistical inference, the most -- the best known one being the multiple hypothesis testing problems.

So, it is something that one can look at, but you have to be careful about doing it, otherwise you could be rejecting the existence of damages for groups that were actually damaged and what you are finding is just the statistical variation in one of dozens or hundreds of coefficients.

PROFESSOR NEUBERGER: I really take that point. What I was thinking was that you have actually got groups who are more proximate to where the cartel was operating the large volume transactions, the voice market and particular currency pairs, and then you have got the areas which are more remote from that, maybe electronic trading, maybe other cross-currency pairs and so on, which are more remote, and if one found a systematic connection between some notion of remoteness and impact and found with some of the more remote groups there was no significant impact, then you would then conclude that there was no significant impact on those groups. That is a fair summary?

PROFESSOR BREEDON: Yes.

PROFESSOR BERNHEIM: Yes.

PROFESSOR NEUBERGER: Thank you.

I was going to go on to talk about the question of size, because that seemed to me particularly interesting since, I mean, I think there are some reasons for assuming that the impact of information would be much greater for larger trades than for smaller trades and I was wondering whether either of you had any feeling about this.

PROFESSOR BREEDON: Yes, I think -- (overspeaking) -- oh, sorry, you start.

PROFESSOR BERNHEIM: Go ahead.

PROFESSOR BREEDON: I was going to say, yes, there is a few things. First of all, you seem to -- you know, you do observe, just with spreads themselves, they tend to widen with larger trades which, if you think about, you know, how much it costs to do a larger trade in terms of, you know, the order processing costs we were talking about earlier, you would have thought it would shrink, and I think the fact that these large trades have wide spreads suggests to me, as you say, that they would be more likely to be where the information lives.

PROFESSOR BERNHEIM: I think that that is very clearly something that bears investigation and it would not be hard to investigate, because we can observe the size of the transactions and determine whether there is a differential effect by size.

PROFESSOR NEUBERGER: Thank you very much. Thank you.

The other area I just wanted to go into was the -- one important area of difference between the two PCRs, which is the question of trades at the fix and front-running and so on, and as I understand it, the -- your methodology -- the methodology you would use would at least go some way towards capturing the loss incurred by those traders; that's correct, is it?

PROFESSOR BERNHEIM: Yes.

PROFESSOR NEUBERGER: Let me understand a bit more, because I think it is quite complicated to think through, and the methodology itself has an effect on the way it is done.

Let us take a situation where the -- somebody is -- some dealer is aware of an order at the fix -- a buy order at the fix and there is obviously an incentive then to manipulate the fix upwards. So, the dealer may be in concert with other dealers, does some trades, or forebears to do some trades, and you could see that there would be quite a lot of people who would gain and lose by the sorts of transactions which take place. Obviously the person who does the -- who is going to do the trade at the fix loses by the amount by which the fix has been moved, but the other parties who were counterparties to the manipulative trades, some of those will gain and some of those will lose. On the whole, most of those will gain because the bankers are trying to buy the underlying currency at an elevated price to force the price up -- and maybe I am wrong on that, but --

PROFESSOR BREEDON: I'm sorry, I would say that the other way round. I think most would lose, although you are right -- I mean, the thrust of what you are saying is right, that the -- there would be quite a large balance who would -- who would gain.

PROFESSOR NEUBERGER: I mean, so what my question -- let me put it as a question then.

You have a methodology which would include these trades. How does your methodology, when it works out the damage to the class, sum together the damages and gains faced by different people?

PROFESSOR BREEDON: So, yes, it is all in there. So the gain -- so those who gain effectively will get -- will in a sense be measured as having a spread that is smaller than it should have been and those who -- who lost will have a realised spread that is bigger than it should have been, so -- so, yes, so it will all come out in the wash, although, you know, the problem we will have is, you know, I will not be able to -- if you ask me can I tell you -- can I tell you which of those -- which of the individuals it was who gained or lost, that is a more difficult question, oddly, but I can certainly -- I am pretty confident that the -- that it all nets out, that the gains are in there as well as the losses, when we do this -- do this realised spread methodology.

PROFESSOR NEUBERGER: I tell you what is bothering me about this, that if I am trying to manipulate the spread -- the fix, I am pushing the price and making the victim pay a much higher price --

PROFESSOR BREEDON: Yes.

PROFESSOR NEUBERGER: -- but I incur some cost because I have to buy at above the market rate, and I will -- I do not make the full profit that my victim loses, because I give some of it up in the cost of manipulation. I am putting it to you that your methodology does not actually get at the loss to the victim, it gets at the profit to the bank. Is that a correct understanding?

PROFESSOR BERNHEIM: Well, it is -- remember that between -- as between the bank and the universe of customers, it is a zero sum game. If the bank is gaining -- I think this is what Mr -- Professor Rime misses in characterising realised spreads as being about revenue rather than price. Revenue is price times quantity. If revenue does not change, then prices change. You cannot change one without changing the other. If zero sum of quantity is fixed, then in these damage calculations quantity is fixed. So a gain to the -- to the bank, to the dealer, is a loss to the customers as a whole.

Now, what you are pointing out is that those losses may be unevenly distributed across customers and in fact some may be getting gains, some may be getting losses. The average over all of them has to be equal to the average impact for the bank, it just has to average out, because it is zero sum.

PROFESSOR NEUBERGER: That I understand, but my problem is this, that the bank, the cartel, has robbed one particular customer of £100. To do that they had to give away £80 to other people in order to manipulate the price, because manipulating the price is not costly, and so the only claim that you are then making against the bank is the £20 and not the £100.

PROFESSOR BREEDON: Yes.

PROFESSOR NEUBERGER: Is that correct?

-- (overspeaking) --

PROFESSOR BREEDON: (inaudible) and I just would say, there is nothing to add, because it comes up in the US evidence.

The other thing that happens coming up into the fix is that the cartel will deal in the interdealer market, so effectively they will -- but I mean that is just to highlight that the harm is not all in the customer/dealer relationship, it is also in the interdealer relationship.

PROFESSOR NEUBERGER: There is another question which troubles me, which is the following. If I am really trying to measure the losses incurred by people from the manipulation of the fix or from front-running, then it is not obvious to me that I would want to do so in the context of a model which looks at all trades, many of them far, far smaller. Why should I want to fit a model to millions of trades where the impact on the spread, the way it behaves and all that has absolutely nothing to do with what happens at the fix? Surely if I wanted to measure the impact of manipulation on the fix, I would not use that same model, I would use a model which is looking at the trades that might be affected?

PROFESSOR BERNHEIM: So, what we have proposed is to use a class of modelling strategies that allow for arbitrary sets of interactions between market factors and dummy variables describing the characteristics of the transactions. The fixed transactions, that is one class, and we would certainly have a dummy variable capturing that. By interacting that with all of the other market factors, you are essentially creating a separate model for the fix transactions. It is equivalent to running a different model.

Now, the reason that we would prefer to do it in this form is that there may be certain characteristics that -- market characteristics that have similar effects on these transactions and other transactions, and if that is the case, then by constraining those coefficients to be the same, we estimate them to be nearly the same, we then estimate a constrained model where they are the same, you potentially gain some efficiency advantages, efficiency in terms of statistical efficiency.

But the approach allows us to segregate any class of transactions and trade it separately for the purpose of measurement.

PROFESSOR NEUBERGER: Clearly, in the extreme form where you have an interaction on all your variables, interaction term, you end up with a collection of completely separate models.

PROFESSOR BERNHEIM: Yes, sir.

PROFESSOR NEUBERGER: But then --

PROFESSOR BREEDON: Sorry, just to add to -- not to add to that, but add to your original question was that -- so you say why do I not just focus on the big players around the fix. I would say that means I have already imposed my prior that I do not think that the small deals were involved in this, and I am not -- the small deals were not involved, admittedly, obviously, only in a very minor way, but you know, they could have been involved. It could have been, as you say, the run up was actually done in rather small trades and the -- and then the big fix trades came along and that was where the money was made. So, I am not sure I would want to have a prior that I could tell you what type of trades, you know, either gained or lost in a benchmark fix.

PROFESSOR NEUBERGER: But I was just thinking of the evidence of the huge variety of trade sizes and how there is a great number of trades which are, say, under $100 million and they are really not relevant to the trades we are talking about, I presume. I presume. I mean, I do not --

PROFESSOR BREEDON: Yes, we do not really know, and so it is a fair point. But I think there are -- it is true they are small, but there are an awful lot of them, and therefore each -- you know, they add up to be a big number and I would not -- you know, I would not want to exclude them a priori, I guess is my point.

PROFESSOR NEUBERGER: My final question then is, going down that track of trying to think about the -- what is happening at the fix as being somewhat different, does that not -- is there not a danger that this conflicts with the general notion of representing a broad class and one ends up looking at -- going down the route of looking at the harm to specific rather small groups which very different from the broad class one is talking about?

PROFESSOR BERNHEIM: I think there are still large groups within the class. This is far from an -- very, very far from an individual transaction analysis, it is just allowing flexibility within this framework for sub-classes of -- broad sub-classes of transactions.

PROFESSOR NEUBERGER: Thank you.

PROFESSOR BREEDON: I think, you know -- and, again, as Professor Bernheim has already said, you know, a lot of this work is done by the interaction term so that you -- you know, if you have trade size in there and how it interacts with the cartel, if your supposition is right that small trades are not affected by the cartel, what we will find is the interaction term will tell us that the -- you know, that there was no cartel effect on trades up to a certain size and that it was all in the big trades, and that will come out in the empirical work, so -- so it is -- so we have -- you know, even if that were true, I think we would have a way of distinguishing.

PROFESSOR NEUBERGER: Thank you very much.

THE CHAIRMAN: Mr Jowell, I do apologise, I know this is your time. I have got a couple of questions.

MR JOWELL: Well, I can confirm, sir, that I have no questions for re-examination so far.

THE CHAIRMAN: Well, that is very helpful. In that case, what I will do is I will ask my questions. If that remains the case, we will rise or discuss housekeeping, but I will get my questions off my chest and we will see where we go. But thank you for that indication.

Professor Bernheim, I am going to do what irritates every witness I am going to read back something that you said at page 179 of the [draft] transcript and you are saying:

"... if someone were to chop the class up into a hundred different categories and estimate several effects for every one of those categories, simply by chance, some of the distribution is going to show no effects, and that does not mean that the real effect was not there, it means that you have a distribution of estimates."

Now, what I am asking you is does the converse apply, that where you have a distribution showing an effect, it could be, as it were, a false positive, a false effect and there is in fact no effect?

PROFESSOR BERNHEIM: Yes, so, I referred in passing to the multiple hypothesis testing issue and that shows up where you proliferate the number of hypotheses that you are testing. So it could be a hypothesis for each of many different sub-classes, and then you look around for the ones where you are getting statistically significant coefficients and you say, "A-ha, I have found the spot where the cartel is effective", and that can be a mistake. The literature on multiple hypothesis testing tells you how to adjust the size of the confidence intervals to make sure that you are not falling prey to the multiple hypothesis -- it is early in the morning for me after a long night -- the multiple hypothesis testing fallacy. There are ways of protecting yourself against making that mistake.

THE CHAIRMAN: Thank you.

What triggered my interest in that was, Professor Breedon, your description of how the adverse transaction, if I can call it that, feeds through into an effect on spreads, and I am going to use what I am sure Mr Hoskins would say is a very dangerous analogy, I am going to say it felt to me, as a lawyer, like the notion of pass-through that we have where the cartelised effect is passed on to a set of other persons, usually other consumers, and it seemed to me that that was an analogy of what you are saying. You have got to this adverse transaction and it gives rise to an additional cost, an unexpected and uneconomic cost, which you then seek to discharge or distribute across a series of minor changes to the spreads.

Now, I know all analogies are imperfect, but before I go on to my next question, is it an analogy that is worth spending time on, or is it so imperfect that we should just --

PROFESSOR BREEDON: I think it is, although we are both at a loss, because I am not quite sure about the concept of pass-through, so -- but, yes, it sounds like I do not want to be, but you know -- but yes, I think it is an analogy that we can continue, yes.

THE CHAIRMAN: Professor Bernheim, you do not have any major problems with that way of describing the operation of the adverse transaction on the spread?

PROFESSOR BERNHEIM: I think I would have used a different analogy. Can I try my analogy on you?

THE CHAIRMAN: Well, since Mr Jowell has given us an extra 20 minutes, yes.

PROFESSOR BERNHEIM: So, think of the interdealer market as being like a swimming pool, and the thing about this swimming pool is that there are sometimes sharks in it, and you know, that represents the adverse selection, the fact that there may be better informed parties around, and if you are a dealer, the question is how much -- how much would you insist on being paid to jump into the pool, not knowing whether at this moment the sharks happen to be there or not, okay? So it is like you are blindfolded and you cannot see before you jump. Now, the fact that the sharks are there some of the time and not there other -- at other times does not affect the answer to that question if you do not know whether this is the moment when the sharks are there or not.

So, from the point of view of a dealer, if this adverse selection exists in the interdealer market, if they are going to jump in, if they are going to use the interdealer market in expectation, because of the adverse selection, they are suffering a loss, and that expectation is always there, even if the manipulation, even if the exchange of information is only sometimes there, the expectation of getting burned, getting eaten by a shark if you dip your toe into the interdealer market is always present, and that means your costs are higher and that is why you, as a dealer, then raise the prices to your own customers. It is more costly for you to do this.

THE CHAIRMAN: Okay, that is fair enough, and I can live with your analogy, because actually it does not affect the point that I am going to go on to, because I think all you are saying is that whereas my analogy was referring to an adverse transaction, as it were, as a known thing, creating an additional cost, you are saying -- and for the sake of argument I am quite prepared to accept that -- the additional cost exists as a potentiality. You are aware of the risk, the shark may or may not be there, but the fact that it may be is something which creates the additional cost which is then fed through into the spreads. But I think the feeding through into the spreads, which is my pass on analogy, is one that seems to be holding good so far -- touching wood.

PROFESSOR BERNHEIM: There is -- there is a portion of this that involves some degree of pass-through of those increased costs into prices charged to customers.

THE CHAIRMAN: Okay.

PROFESSOR BERNHEIM: It would be stunning if there was no pass-through or negative pass-through. I mean, there are lots of estimates across a wide range of industries. We have seen some in this case --

THE CHAIRMAN: Well, I do not want to get too hung up on pass-through, I am simply seeking to identify, as it were, a mechanism whereby the additional cost, be it the adverse transaction or the risk of the adverse transaction, is translated into a recovery of that additional cost by way of an adjustment in spreads. That is what I am just trying to articulate in my own mind.

MR LOMAS: The only point I was going to make, back to your shark and swimming pool analogy, presumably that is a risk-weighted calculation. You know that there is a chance --

PROFESSOR BERNHEIM: Yes.

MR LOMAS: -- of a shark in there, you do not take that as binary, yes/no, we are talking about money here, it is a fungible, it changes. So you would -- if it is a 5% chance, your spread impact would be very different from a 95% chance.

PROFESSOR BERNHEIM: Yes.

MR LOMAS: Okay, thank you, that was the only point.

PROFESSOR BERNHEIM: It would also -- it also is a matter of whether you just get bitten or whether you get eaten.

You know, it is the magnitude of what you lose if the shark happens to be there, and these are all empirical questions, we just cannot know the answer to that until we dig into the data.

MR LOMAS: Indeed how big the shark is.

PROFESSOR BERNHEIM: How big the shark is, exactly.

THE CHAIRMAN: Now, sticking with my pass-on analogy and now identifying a real difference between the way lawyers see pass-through and the way economists do, I always think that lawyers, when they articulate what they understand by pass-through, get very puzzled looks from economists, because what the lawyer is looking at is something which is a cost that can be seen as not retained by the intermediary but is passed on to someone else down the chain. So if I am buying a cartelised good and I sell it but with a markup to take account of the cartelised price I have paid, then the loss is something that I, the intermediary, have not suffered but someone further down the line has.

Now, that implies a very uneconomist-like view of how costs work, because economists say, well, if you have got a cost, you pass it on, because otherwise you are going to go out of business, you have got to make sure that you recover your costs. So that is a long lead up to my question, which is this.

You have identified a particular cost which is passed on into an adjustment of spreads which is the adverse transaction or the risk of an adverse transaction. But at the same time there are going to be a myriad of other factors which are going to affect the traders' and the bank's view of cost which are going to be operating before, after and during all of these transactions, and I mean, it could be a bad decision you have made in another trade, simply an error of judgment, it could be the fact that you have overpaid on the lease that you have just negotiated for your new premises.

How does one go about separating these, in time, identical elements which can come from all sorts of directions? I mean, I know you are going to say, "We are just the model", but can you give us a little bit more meat on the bone just to understand how you are going to go about this?

PROFESSOR BERNHEIM: Well, let me say two things about this. One is the simple thing that I think you have anticipated, which is, you can look for various measures of these factors and try to include them in the model. However -- and this is an important point that I think people often miss -- when you do not explicitly include a factor in the model, that does not mean it is not in the model, it just means it is in a different spot in the model. It appears in what we call the "error term" or the "statistical disturbance term".

Now, the important thing to realise is that when we study the clean period we learn about, you know, average spreads and how average spreads are related to market conditions that appear in the equation, but we also learn something else -- and this is the part that people usually skip -- we learn about the variance of that error term. What that means, stated differently, is we learn about how the naturally occurring variation in the other factors that are not in the model translate into variation in the spreads, and knowing that allows us to make precise statistical statements, when we look at the cartel period, about the probability that the elevation in spreads that we may end up finding is attributable to this variation in these other factors that we have not been able to find counterparts for and include in the model. We can make statements about the probability that the variation and those things could have produced what we are seeing.

So, these kinds of factors, a lot of the things that you are describing, you know, they can be very idiosyncratic factors; they are creating a lot of little variation. We can measure that variation, we can measure, you know, the variation that they cause in the spreads collectively. Not individually but collectively.

So that is -- that is, sort of, our two-pronged attack on this issue. We control for what we can control for, and then what we cannot control for, we make statistical statements based on what we learn about the error term.

THE CHAIRMAN: If I can be very crude, though, is that simply an analysis which is based upon an assumption that the clean period where there was no anti-competitive behaviour is to all intents and purposes the same as the dirty period when there was anti-competitive conduct but for the anti-competitive conduct?

PROFESSOR BERNHEIM: So, but for the factors that are in the model, obviously you can control for any difference. For factors that are not in the model, if you have a proxy, if you have something that is correlated with them, you will be able to test the hypothesis that they are the same in the cartel period or not. Otherwise you have to look at those factors and say, you know, is there any reason why these things would have varied systematically over time?

If there is a reason, then generally you can trace that reason to a measure of something that you could either put in the model or that you could use as a diagnostic to test whether there is a problem. So it is asking yourself is there a reason why you think that this problem might occur and then finding the evidence that convinces you that that reason is meaningful and turning it into a variable.

THE CHAIRMAN: Well, thank you very much, both of you. I am just checking to see whether there are questions here.

Mr Jowell, you have, by my reckoning, ten minutes, but can I assume you do not need them?

MR JOWELL: I do not need them, sir.

THE CHAIRMAN: Well, Mr Jowell, I am very grateful.

Professors, we are all very grateful to you, particularly you, Professor Bernheim, for sitting through the night for us. Thank you, that is greatly appreciated. We would have tried to accommodate you, but I am afraid we have to rise at 4.30. So thank you very much, it is all really greatly appreciated.

Unless there is any housekeeping -- we have, amazingly, ten minutes for housekeeping, but unless there is anything, we will resume with submissions tomorrow at 10.30. I am guessing from the deafening silence that we are done for today, in which case can I simply thank you all very much, we will adjourn until 10.30 tomorrow. Thank you.

(4.22 pm)

(The hearing adjourned until 10.30 am on Wednesday,

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