

**A Review of the possible consequences of
a change in contract terms from “in
warehouse” to “FOT basis”, with respect
to all metals traded on the
London Metal Exchange**

A study by Europe Economics

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Europe Economics

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EXECUTIVE SUMMARY

Introduction

- 1 This study, which was commissioned from Europe Economics in July 2006, assesses the effects of changing the terms of the London Metals Exchange (LME) contract for metal delivery from “in warehouse” to “free on truck” (FOT). This would make it similar in some respects to the new plastics contract. Europe Economics regularly reported on the progress of its work to the LME FOT Study Working Group, which was chaired by Professor Philip Crowson and included Jim Coupland, chairman of the Warehousing Committee, Miles Linington, vice-chairman of the Warehousing Committee, Liz Milan, Head of Physical Operations, Alex Morley, General Counsel & Head of Enforcement, and Robert Hall, Warehouse Listings Manager.
- 2 Some LME members and other market participants have, over a number of years, expressed concern about the level of the FOT charge, its relationship to other elements in warehouse revenue and expenditure and the possibility that the charge could, directly and/or indirectly, distort the market for metal. Various studies by the LME since 1996 have examined this issue.
- 3 This report covers the contractual, operational and financial implications for market participants of the possible change to the terms of the LME contract. Legal issues are outside the scope of this study.
- 4 The likely impact of a change and how it might be implemented is described, but the terms of reference of the study do not require a recommendation on whether or not the change should be introduced.

Methodology

- 5 The empirical basis of this report was provided by previous LME studies of warehousing, published and unpublished market data and a programme of discussions with LME staff, past and present members of LME committees and representatives of firms in the metal industry. These discussions were of particular value.
- 6 The available statistical data are not complete and much of the information of immediate relevance to this study is commercially sensitive. The conclusions of this study rely heavily, therefore, on evidence drawn from interviews with stakeholders, experience in other markets and reasoned analysis.

The Global Metal Markets and the LME

- 7 The four main markets that would be affected by the possible contract change (the LME, the physical metals market, the LME over-the-counter market and the warehouse markets) are all interlinked, and the analysis of any change in any one part of the system has to take account of likely consequences across all these markets.

- 8 In the physical market, demand and supply for metals are the fundamental determinants of price. Supply, stocks, volumes of trade and demand all vary significantly with the state of the cycle. Over the last fifty years the centre of gravity of the metal markets has moved from the UK and Europe to Asia and the Far East.
- 9 Physical prices are normally quoted by reference to a premium to the price quoted on the LME for the warrants that carry title to metal in LME warehouses.
- 10 The reliability of the LME price as a guide to the physical markets derives from the requirement that all LME contracts are for physical delivery of metal of specified standards and from the extent and depth of the exchange's liquidity.
- 11 The over-the-counter market provides a facility for trading a warrant for metal in an undesired location for one that more closely meets the needs of a purchaser requiring delivery of metal.
- 12 As an exchange the LME competes with other exchanges in the United States and the Far East and this competition has been strengthened by the opportunities that technological advance has afforded for the exploitation of economies of scale.
- 13 The LME is supported by a network of warehouse companies which provide the guarantee of physical delivery. Their licence agreements with the LME require them to meet requirements set by the LME for financial strength, physical facilities and procedures, including capabilities to deliver out. The agreements also contain a requirement for the warehouses to fix and notify to the LME the maximum rents and FOT charges that the warehouses will levy each year.
- 14 The warehouses have in principle three ways of generating revenue related purely to their LME business. These are: charges for handling metal as it comes into the warehouse; rent for stored metal; and the FOT charge. LME warehouses may additionally store metal off-warrant together with a variety of other goods. In practice LME warehouses rely on two main elements of revenue. There is little or no income from in-charges so that the two main items are rent and the FOT charge. Apart from the costs of running the warehouse the principal cost lies in offering discounts and rebates to depositors in order to attract metal.
- 15 The LME requires that in- and out- charges should not be "excessive". However, the precise meaning of this requirement is not defined and we understand that the LME has been advised on a number of occasions that it might be in breach of competition law if it attempted to set or regulate prices.

The Effects of the Possible Contractual Change

- 16 The relationships between the metal markets are various and the effects of a change in the LME contract from "in warehouse" to "FOT" are correspondingly complex. In the discussion which follows, all comparisons are made with the situation that would have

obtained in the absence of the change in contract form being considered (the “counterfactual”).

Effects on LME warrant prices

- 17 The removal of the FOT charge would add to the value of the warrant. It would do so because the warrant holder would no longer be liable to pay this charge, and so the value of the warrant would be increased for each potential warrant purchaser by his estimate of the net present value of that future liability. This value would differ according to the warrant type, but the value of all types of warrant would be increased.
- 18 Even those purchasing warrants with the intention of trading them on will be influenced in their valuations by the knowledge that the final holders will no longer face the FOT charge.
- 19 The likely size of the increase depends in the long run on any effects on the supply of warrants as well as on the increase in their value to purchasers. The effects on the supply of warrants at any given price would develop over time, and would depend on any consequences of the change in contract for the competitive position of LME warehouses. As discussed below, these consequences would be adverse so that the long-run supply of warrants would tend to be reduced.
- 20 It is therefore safe to conclude that the effect of the change would be to increase the price of warrants compared with what it would otherwise have been. It is not possible to be precise about the size of the increase, but in the short run it might be about the same order of magnitude as the FOT liability from which warrant holders would have been relieved.

Effects on producer premiums

- 21 There are two reasons why the contract change might lead to a reduction in producer premiums, at least in the long term. Assuming no change in supply and demand fundamentals, any rise in the LME warrant price resulting from a contract change (as discussed above) would have to be offset by a reduction in the physical premium if the end price were to be unaffected.
- 22 From another perspective, since the cash physical price and the price of metal from an LME warehouse must be approximately equal (because of arbitrage) the producer premium must also equal the sum of costs over and above the warrant price involved in obtaining metal from the LME warehouse. This implies that, all other things being equal, a contract change which moves the FOT into the LME warrant price should be reflected in an offsetting decrease in producer premiums.
- 23 However, the other side of the coin is that producers might well be reluctant to accept that there had been an increase in the LME price compared with what it would otherwise have been. Producers might, therefore, insist that premia should not be adjusted. Such

arguments might not be sustainable in the long run, but they could be important in the period following the change.

- 24 It was also suggested by some interviewees that producers' sales teams would prefer a combination of low price and high premium to a combination of high price and low premium, even if the sum of the latter were greater than that of the former. This is because bonuses are linked to negotiated premiums rather than to the total actual price paid. This is an added reason for scepticism about the likelihood of an early reduction in premia to offset the increase in the price of warrants.
- 25 Another potentially important point for the long term is the effect of any reduction in LME stocks, compared with what they would otherwise have been. Other things being equal, lower LME stocks could increase the ability of producers to charge higher premia, since diversion of stocks to non-LME storage would reduce market transparency. We consider the impact on LME stocks below.
- 26 Our assessment is that premia might well reduce in the long term and on average tend to offset the increase in the value of warrants, but that the effects on premia are uncertain, so that there could well be a significant period during which they were maintained.

Effects on the warehouse market

- 27 LME warehouses provide services to three distinct categories of customer – depositors, warrant holders, and those withdrawing metal.
- 28 LME warehouses are able to attract metal from depositors through a combination of the advantages offered by the warrant, which is the central point of the overall LME system, as well as by their own warehousing services. They also offer incentives to depositors in the form of payments, discounts or rebates of rent.
- 29 Second, warehouses charge warrant holders rent for the storage of metal. Maximum rents are required to be notified to the LME each year. Some warrant holders pay the maximum rent, but others are able, by virtue of their ability to exert competitive pressure, to negotiate discounts from the maximum rents notified to the LME. The extent of a reduction is subject to the leverage exerted by warrant holders.
- 30 Customers in the third category, namely those withdrawing metal, are not usually able to negotiate discounts from the FOT charges. Warehouses have no economic incentive to discount the FOT charge, although it is evidently set at a significant margin over short run incremental costs of the specific services involved.
- 31 Thus warehouses face different degrees of competition in their dealings with depositors, warrant holders (over rent) and those withdrawing metal. This fundamental feature of the warehouse market has enabled warehouse companies to make FOT charges a significant part of their income.

- 32 If warehouses are prevented by the change in contract from levying FOT charges from customers whose demand is (for these obvious reasons) less elastic than that of the other categories, it is most unlikely that any increases in rent or other income sources would fully compensate. Although reductions in incentives to those putting metal in warehouse are to be expected, it would not be in a warehouse's interest to take this too far. Those deciding where to place metal generally have realistic alternatives. It follows that warehouse incomes would be reduced by the change in contract.
- 33 The order of magnitude of the fall in warehouse income will be strongly influenced by the stage of the metal cycle and the level of stocks at the time, but FOT charges clearly represent a significant part of warehouse income over the cycle as a whole. We estimate from stakeholder discussions that, over the cycle and averaged between metals, this loss of warehouse income might be of the order of 20 per cent or more. The strong cyclical effects on warehouse stocks and throughput mean that the significance of the loss of FOT income would vary considerably around the long run average.
- 34 The likely fall in net incomes would be lessened to the extent that warehouses were able to increase revenue from rents or reduce incentives, but it would remain significant.
- 35 The response of warehouses to any prolonged decline in revenue will vary from warehouse to warehouse and will depend in part on the importance to them of the LME component of their business, but the capacity of LME warehouses could be reduced.

Effect on LME stocks and flows

- 36 Although (other things being equal) an increase in the value of the warrant would make the LME warehouses more attractive as a destination for metal, the reduction in the incentives offered by warehouses would be likely to have a stronger effect and lead to a fall in the amount of metal placed on LME warrant.
- 37 Moreover, the absence of a charge to those withdrawing metal would (again, other things being equal) increase the amount of metal withdrawn. The change of contract would be equivalent to the imposition of a zero price on warehouses for exit services. As a result, the metal in LME warehouses would, at the margin, have been made easier to access, increasing the likelihood of withdrawal.
- 38 It is sometimes suggested that a reduction of warehouse incentives would redistribute total LME stocks into more appropriate locations, since fewer incentives would be available. However, the optimal location and overall LME warehouse capacity is an issue essentially separate from the possible contract change.

Effects on the liquidity and transparency of the LME system

- 39 If there are reductions in LME stocks relative to other stocks, this would reduce the transparency of the system.

- 40 This effect would be increased if there were an increase in the proportion of LME stocks that are illiquid as a result of financing deals. It might be rational for warehouses, having lost the certainty of the FOT charge, to try to negotiate commitments from depositors that metal would be held for agreed periods.
- 41 The LME system is evidently able to provide reliable prices through very different stages of the cycle and associated stock levels, and there is no close relationship between physical stocks and the liquidity of the warrant market (which reveals the reference price). At the margin, however, a reduction in the LME stocks of metal would reduce transparency and affect liquidity.

Effects on metal prices

- 42 Fundamentals in the metal markets will be the most important long run influences on metal prices. However, as the preceding discussion indicates, there are a number of ways in which the contract change considered here might have an influence.
- 43 The most important would arise if there were a significant reduction in confidence in the LME system, stemming perhaps from a reduction in stocks, or perhaps from the uncertainties associated with introducing the change. Prices might become more diverse and volatile, and trades less efficient.
- 44 If before the change the warehouses were making above-normal profits, a reduction would be analogous to (say) a reduction in transport costs, or other equivalent improvement in efficiency. However, even a substantial reduction from the perspective of warehouses would represent an extremely small percentage of overall metal costs.
- 45 There would also be the effects of the increase in the value of LME warrants. Producers' premia might fall in the long term to offset the increase, but this is not certain. Any reduction in the liquidity and transparency of the system could tend to increase prices in the long run, compared with what they would otherwise have been.
- 46 The overall effect of the contract change would not be to reduce metal prices.

Implementation Options

- 47 Three main options for the implementation of a change to the warrant were considered.
- (a) Option A: Warrants could be "faded out" by stipulating that, from a date further out than any existing LME contract (e.g., 64 months), all new warrants would be FOT inclusive and all existing warrants would then be deemed to be FOT without further payment.
- (b) Option B: On a given day all new warrants would be inclusive of the FOT charge and all new LME contracts entered into after the given date would be on an FOT basis. Existing LME contracts would be unaffected and all existing warrants would remain in

warehouse. Existing and new warrants would be “traded in parallel”, with a difference in price exactly equal to the posted FOT when delivered to settle contracts.

- (c) Option C: On a given day, all new warrants would be inclusive of the FOT charge and all new LME contracts entered into after the given date would be on FOT basis – the “big bang”. All holders of warrants on the given day would be required to pay the FOT charge so as to convert their warrants into FOT warrants. Existing future contracts would be required to be settled at the contractual price plus the FOT charge if a FOT warrant is used to settle the contract. Immediately after the given day all warrants and contracts, however prompt their execution, would all be FOT-inclusive and there would be no transition period.
- 48 Option A, “fading out”, has the advantage that the length of time involved could enable all concerned to make adjustments in time to avoid any payment of FOT on existing in-warehouse warrants. Option B, “parallel trading” has the disadvantage that considerable problems arise from the simultaneous existence of two different kinds of warrant. Option C, “big bang” has the advantage of a clean change, but would impose on existing warrant holders the need to pay FOT earlier than expected.
- 49 None of the practical problems associated with the three options is insuperable. Whichever decision LME chooses, it is capable of implementation.

1 INTRODUCTION

- 1.1 In September 2005, the Warehouse Committee of the London Metal Exchange (LME) requested that the Executive Committee (ECOM) commission an independent study to investigate the implications, for all LME markets, of a change in contract from “in warehouse” to “free on truck” (FOT) basis.
- 1.2 The LME invited tenders for this study and Europe Economics was chosen from a number of competitors in July 2006. A public announcement of the study was made by LME on 11 October 2006.¹
- 1.3 The study was been carried out in consultation with an LME FOT Study Working Group chaired by Professor Phillip Crowson, a former Invited Director of the LME. The other members of the Working Group are Jim Coupland, chairman of the Warehousing Committee, Miles Linington, vice-chairman of the Warehousing Committee, Liz Milan, Head of Physical Operations, Alexander Morley, General Counsel & Head of Enforcement, and Robert Hall, Warehouse Listings Manager.

Contractual Change

- 1.4 Currently the LME contract for all metals traded on the LME is on an “in warehouse” basis, which means that the withdrawing party, having once received the warrant, needs to pay delivery-out charges to the relevant LME warehouse when it wishes to withdraw metal from the warehouse.
- 1.5 The contractual change in question is to change the LME contract to a “free on truck” inclusive (FOT) basis, which means that the buyer, once having received the warrant, does not need to pay separate FOT charges.²
- 1.6 It is notable that the current LME contracts for plastics are already on a “free on truck” basis.

Case for the Change

- 1.7 Some parts of the metal industry (especially as represented by the International Wrought Copper Council) have raised concerns about a component of the LME system: the separate FOT charges currently levied by LME approved warehouses. These complaints include allegations that:

- (a) LME-approved warehouses offer excessive incentives in order to encourage the placing of metal on to warrant in their warehouses;

¹ <http://www.lme.co.uk/4745.asp>

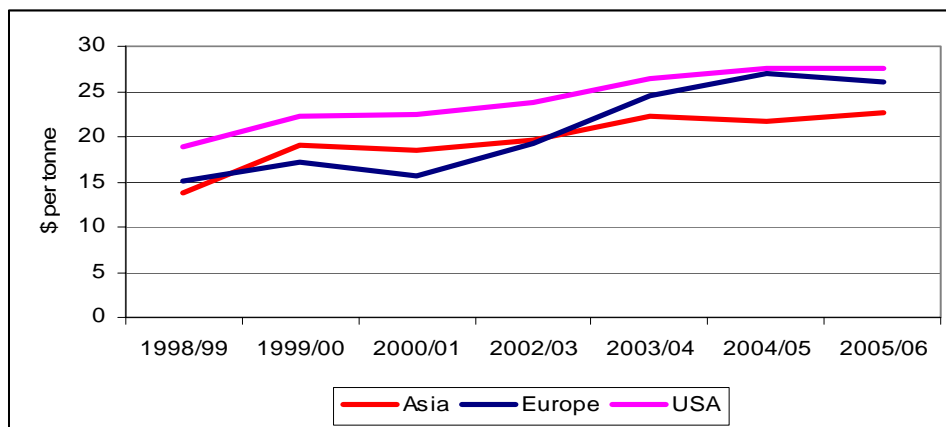
² However, if the transportation mode chosen by withdrawer is different from truck (e.g. ship, rail), then the warehouse may charge the difference between FOB (free-on-board) and FOT charges.

- (b) these incentives lead to disproportionate amounts of warranted metal accumulating in certain locations, thereby distorting the market;
- (c) warehouse companies act collusively to set an excessive FOT charge in order to finance incentives; and
- (d) the result of the unduly high FOT charges is to add to producer premia and thus to the costs of metal fabricators.

1.8 Between the financial years 1998/1999 and 1999/2000 worldwide maximum FOT rates grew by 23 per cent.³ However, since then the rate of increase has fallen, with most recent increases being less than the rate of inflation: between 2003/2004 and 2004/2005 the average global rate of increase was 5 per cent and between 2004/2005 and 2005/2006 the global rate of increase fell to a little less than 1 per cent.

1.9 Chart 1.1 shows trends in maximum FOT rates by region since 1998.

Chart 1.1: Maximum FOT rates – all regions, 1998/99 to 2005/2006



Source: LME, Europe Economics calculations

1.10 Some parts of the metal industry remain convinced that FOT rates are unduly high. They believe that this issue could be addressed by the introduction of an FOT contract, whereby the party withdrawing metal will no longer be liable for the out charge.

Previous Studies

1.11 The issue of changing from an “in warehouse” contact to an “FOT basis” has been discussed by the LME at various times in the past. As noted in *LME Warehousing: A Discussion Paper*, one of the proposals of the SIB Review of Metals Markets of 1996 was

³ Europe Economics calculations.

to change the basis of the LME price to “free on truck”.⁴ This proposal was considered by the LME Warehouse Issues Implementation Sub-Committee (WIISC) in 1997 and rejected. The reasons included:

- (a) a change in contract to an “FOT basis” could affect the liability for VAT and might constitute a serious problem;
- (b) a “free out” pricing basis might render the Terminal Markets Order inapplicable to LME trading, thus increasing the cost of LME trading.

1.12 On balance, the WIISC concluded that a change to an FOT contract might create more problems than it solved.

1.13 *The Report of Investigation into Complaints made to London Metal Exchange Ltd about Practices of LME Listed Warehouses (2002)* also contains a discussion of the FOT or out-charges.⁵ This report states:

“It is clear from the investigation that out-charges for LME warranted metal are generally considerably higher than for metal in private store.”

1.14 The 2002 *Report* suggests that reasons for this differential include the warehouses’ practice of not levying an in-charge on depositors, the costs of maintaining a London agent, the cost of maintaining a SWORD connection, the costs of operating in a free/foreign trade zone, the denomination of rents in US dollars, the requirement to store metal under cover, the uncertainty about rental income created by the ability of warrant owners to take metal off warrant without notice and other fees and administrative costs attaching to the operation of an LME licence.

1.15 The 2002 *Report* also asserts that these reasons do not account for the entire amount of the FOT charge and that some of it is used to finance incentives paid to attract metal.

1.16 The *Report* concludes that competition law prevents the LME from intervening in order to set the FOT charge. Instead the solution suggested (and later pursued) was a comprehensive review of LME warehouse locations, metal-by-metal, in the belief that high out-charges are causing “disproportionately large LME stocks [to be held] at locations remote from potential consumers”.

Terms of Reference

1.17 The terms of reference for the present study call for an investigation into the consequences of a change in LME contract terms from “in warehouse” to an “FOT” basis with respect to all metals traded on exchange. Consideration was to be given, in

⁴ See *LME Warehousing: A Discussion Paper* by P. Crowson and others, April 1999

⁵ *Report by the Complaints Officer*, 15 February 2002

particular, to the contractual, operational and financial implications for all market participants of a change in the LME delivery contract. The study was to include examination of the issues listed below.

Contractual:

What are the effects if any on the fundamentals of price discovery?

What are the effects on market transparency?

What is the effect of "FOT" on delivery, particularly in light of the fact that delivery of LME warrants is at the sellers' option?

What is the likely effect on movement of metal in/out and between warehouses?

Operational:

What are the implications for the operation of SWORD and the LCH?

What are the implications of any change of contract with respect to existing forward business, potentially out to 63 months in some cases, and how would changes be implemented?

What is the effect on current LME systems and processes and how could a potential change impact these?

What operational changes would be required by user groups and market participants in the LME?

Financial:

What financial advantages and disadvantages are there for market participants of a change to contract terms?

What are the financial implications to the warehouse company in changing to "FOT" basis e.g. posting of a bond in case of bankruptcy, cash flow etc.?

Other considerations:

What is the experience of other exchanges that have a physical contract?

Consider carefully other issues that come to the attention of Europe Economics during the course of the study.

- 1.18 Legal issues were to be considered by the LME following analysis of the issues listed above, and thus lie outside the scope of this study.
- 1.19 While this study was under way, and after its terms of reference had been set, a formal complaint was lodged by the International Wrought Copper Council (IWCC) with the Directorate General for Competition of the European Commission. This complaint

Introduction

touches upon many of the issues dealt with here, in particular the relationship between the current “in warehouse” contract and the final prices paid on the physical metals market. Nonetheless, this report was commissioned before this complaint was made, is not designed as a response to it, and should not be interpreted as such.

2 METHODOLOGY

- 2.1 The empirical material on which this study is based includes:
- (a) LME studies of warehousing
 - (b) Published and unpublished market data
 - (c) A programme of interviews and discussions with LME staff, firms and associations that were representative of all major types of LME user, together with some individuals, no longer active in the market, with long experience of the LME. These discussions proved to be a most valuable source of information.
- 2.2 A list of studies and of those organisations consulted (some on more than one occasion) can be found in the bibliography and stakeholder appendices.
- 2.3 This information was analysed in order to establish a fuller understanding of the statistical data; and a logical framework for assessing the outcomes of the change in contract under consideration. The nature of the quantitative analysis, the development of a logical framework and the programme of interviews are described in more detail below.

Quantitative Analysis

- 2.4 The statistical data available were not complete, co-extensive in time or compiled on exactly the same basis. Definitive conclusions about potential correlation variables could not therefore always be reached. Thus, the quantitative analysis was augmented by qualitative evidence drawn from stakeholder discussions, reviews of the literature and reasoned analysis.
- 2.5 The main source of data for this study was the LME itself which provided the following time series for the period between 1996 and 2006:
- (a) daily spot prices, 3 month prices, 15 month prices, and 27 month prices;
 - (b) published FOT and rent rates by warehouse operator and location;
 - (c) LME trading volume;
 - (d) LME warehouse stocks; and
 - (e) LME warehouse numbers and locations.
- 2.6 In addition, data on premia and world stock levels were collected from various sources.
- 2.7 In order to extend the area of statistical analysis some data needed to be “cleaned” to ensure that the data covered the same periods and were correctly ordered, and that any nominal rates were in the same currency.

Reasoned Analysis

- 2.8 Because a great deal of the detailed information relevant to this study is commercially sensitive and often unrecorded, the hypotheses on which the study relies frequently derive their strength from statements made by stakeholders in discussion, analogy with and experience of other markets and economic theory.
- 2.9 The general approach was to:
- (a) form hypotheses based on plausible assumptions (e.g. that the relevant market was competitive) and to explore the implications of these theories; and
 - (b) modify the theories and their underlying assumptions in the light of new data and from information volunteered and ideas expressed in the interview programme.
- 2.10 The analysis covers the following separate but related markets:
- (a) physical metal markets;
 - (b) LME market (the provision of exchange facilities and services);
 - (c) the over-the-counter (OTC) market (e.g. trading related to LME warrants but conducted over-the-counter); and
 - (d) LME warehousing market.

Stakeholder Consultation

- 2.11 An initial list of stakeholders for interview was provided by the LME. As well as general stakeholders, this list included members of LME committees, including the Warehouse Committee and the different metal committees. The press release issued by the LME on 11 October 2006 led to other interested companies and some individuals directly contacting Europe Economics for an interview or submitting their views in writing.
- 2.12 In total, 27 interviews were conducted covering all major types of LME users including:
- (a) metal producers;
 - (b) metal users (e.g. fabricators and other direct users of metal traded on the LME);
 - (c) metal merchants and traders;
 - (d) LME approved warehouses; and
 - (e) other parties interested in the relevant issues.
- 2.13 All interviews were conducted in confidence, and all the opinions and views expressed by the interviewees were anonymised or aggregated.

- 2.14 The interviews generally followed a standard format. Typically, the interview duration was one hour (but often longer). The structure of the interview and the nature of the questions were adapted to each interviewee's type of business but the discussion was arranged so as to ensure that the interviewee was able to range widely. The discussion was also designed to cover the way in which the business differs over the cycle. The main topics were:
- (a) A profile of the interviewee's business. Discussion here was designed not to obtain detailed financial information but rather an understanding of the different types of businesses and models operated by a given category of LME users. An understanding of an interviewee's position in the market often helped to illuminate answers to more specific questions.
 - (b) Interviewee's use and views of the LME and LME warehousing market
 - (c) Interviewee's opinion on the competitiveness of various segments of the metal markets and the LME system.
 - (d) Interviewee's attitude to the existing FOT charge, and assessment of rents, physical premia, stocks, flows and the LME price.
 - (e) Interviewee's views on the implications of a change from "in warehouse" to "FOT basis".
 - (f) Interviewee's ideas on how such a change might be implemented.
 - (g) Interviewee's general assessment of the LME and whether and in what respect its operations might be improved.
- 2.15 Where possible and appropriate, further data were sought with follow-up questionnaires.
- 2.16 The majority of interviews were conducted face-to-face. Telephone interviews were carried out only where a mutually convenient time, date and venue could not be established.
- 2.17 All those interviewed, without exception, gave detailed explanations of the way in which they approached their business and made their commercial calculations, and they were open in discussing the policies and operations of the LME. Every interviewee was generous with his or her time, and many of the most experienced provided extensive accounts of how the metal markets have evolved, how they now operate and the threats to which they believed they are subject.
- 2.18 All those interviewed considered the generation of the LME price and the hedging facility provided by the LME to be extremely valuable. The criticisms offered were constructive, pragmatic and driven by an often strongly expressed desire to maintain and strengthen the LME's position. None of their views would be new to those already familiar with LME policy discussions. Almost all of those interviewed were prepared to entertain ideas that

were not necessarily consistent with their own positions or with their own immediate commercial interests. Everyone interviewed was concerned to help preserve the orderly markets that the LME is required to operate.⁶ Acceptance of the current system was often based on an acceptance that the arrangement, whatever its flaws, was known to work. This led to some respondents expressing resistance to any change on the basis of uncertainty in terms of cost and implementation, even if they thought that the change could theoretically lead to an improved system.

- 2.19 At the same time, the views expressed by one person were often at odds with those advanced by another, and sometimes the arguments offered were not consistent in themselves. In part, this was a matter of emphasis. Traders, for example, tend to be indifferent to the institutional arrangements of trading; they attach more importance to the predictability and consistency with which the rules are applied. Their interest lies in the identification and exploitation of opportunities to arbitrage – arithmetic does the rest. Elsewhere there is a more obvious correlation between attitude and commercial interest. Fabricators who draw metal from warehouses have different views from depositors about the FOT charge. In some cases the interrelationship between markets was poorly understood, and there was a wide array of views on the ways in which any change in the LME price, everything else being equal, would affect the premium. Again it was sometimes denied that a contract to deliver metal FOT would, everything else again being equal, be more valuable than a contract for metal in warehouse.
- 2.20 There were also significant differences on matters of fact. It was, for example, suggested by some that FOT and rent charges are non-negotiable, while others stated the opposite. In most cases, such assertions were not necessarily inconsistent with each other. Some warehouse charges may indeed be non-negotiable for small users because they lack market power, while large merchants who maintain a long-term business relationship with warehouses may sometimes be able to negotiate more favourable terms.
- 2.21 Even when there is a consensus among interviewees on certain issues, the views and opinions expressed by some may be influenced by timing considerations. Because the metal business is very cyclical, warehouse charges and expenses have historically varied with the state of the market.
- 2.22 In drawing on information provided by the interviews, Europe Economics did not seek merely to retail some general consensus nor simply to weight views according to the number of proponents. Rather, the interviews were used to assist in both generating and testing hypotheses so that the study could present a set of logically coherent analyses.

⁶ See paragraph 3.30 for the statutory obligations of the LME.

3 GLOBAL METAL MARKETS AND THE LME

- 3.1 This section sets out an overview of the metals system and its components, in particular the role the London Metal Exchanges plays within it. From our appraisal of the global metal system we make a number of observations and corresponding assumptions which form the starting point for our analysis of the effects of the possible change in contract terms.

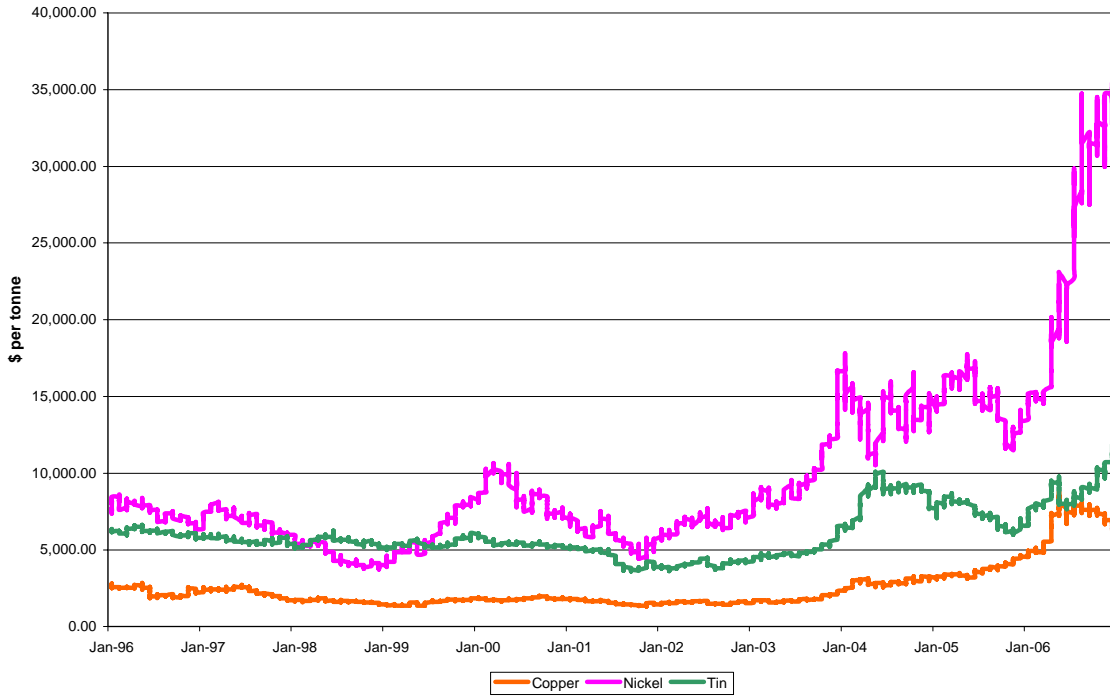
Background and Context

Cycles

- 3.2 Metal markets, like other commodity markets, are cyclical: periods in which supply is short and prices are high alternate with periods of relative glut, tending to lead to low prices. Variations in demand contribute to such fluctuations. Thus, the relationship of supply, stocks, the volume of metal traded and demand will vary with the state of the cycle.⁷
- 3.3 It is, of course, much easier to identify cycles *ex post* (after the event) than it is to predict them. Nonetheless it would be unwise to suppose that a period of high demand will not, at some point, be followed by a period, possibly extended, of low demand or over-supply. Conclusions about the probable long-run behaviour of the market should be interpreted with this in mind.
- 3.4 One obvious indicator of cyclicity is the metal price, which is shown in Charts 3.1 and 3.2 below for selected metals.

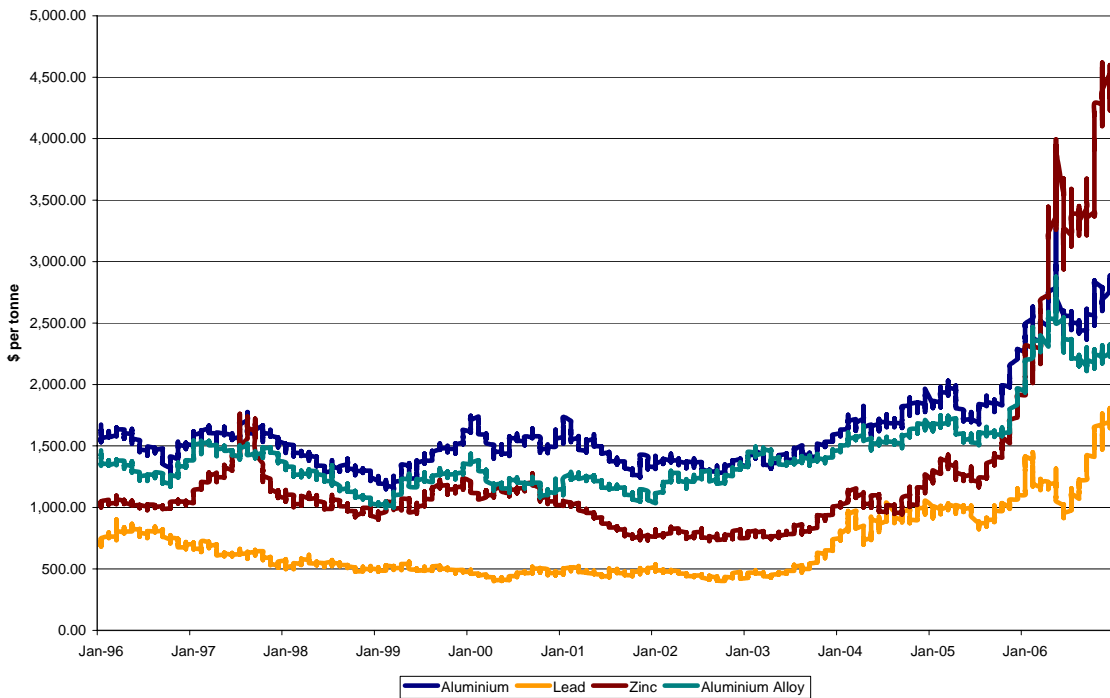
⁷ It is worth noting that, according to Reuters, the market capitalisation weighted average beta of the publicly listed metal mining companies is 1.13. In other words, publicly listed metal mining companies taken as a whole are deemed to be 13 per cent more risky than the whole public equity market.

Chart 3.1: LME cash prices for Copper, Nickel and Tin 1996-2006



Source: LME

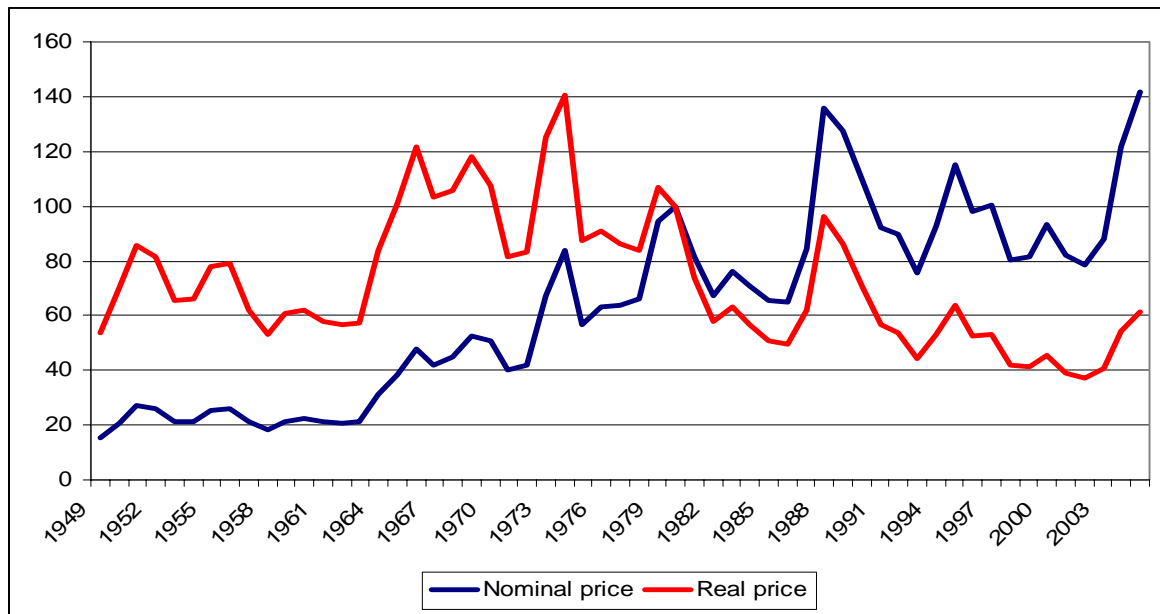
Chart 3.2: LME cash prices for Aluminium, Lead, Zinc and Aluminium Alloy 1996-2006



Source: LME

3.5 As the two charts above clearly illustrate, the most recent trend in the prices of a number of metals has been upward. However, these trends look somewhat different when translated into real prices and considered over a longer timescale, as shown below.

Chart 3.3: Economist Metal Price Index (1949-2005, 1980 = 100)



Note 1: the weights of different metals have changed during the relevant period

Note 2: real price is calculated by Europe Economics by deflating nominal price using US CPI data

Sources: The Economist, US Department of Labor, Europe Economics

3.6 Chart 3.3 shows that the real metal price was in long-term decline between the mid-1970s and the early 2000s but that since the early 2000s there has been a reversal.

Geography

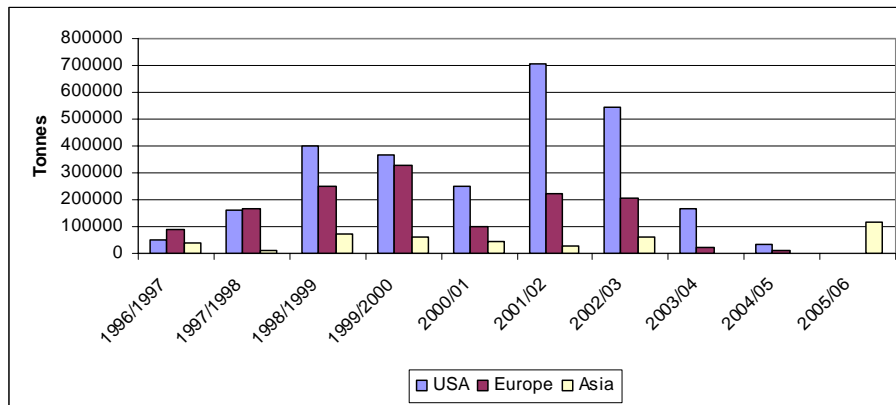
3.7 The geographical configuration of the physical metal market has also been changing. The centre of gravity of the market has, during the latter half of the twentieth century, shifted from the UK to Europe and then from Europe to Asia, and more specifically to the Far East.⁸

3.8 The charts below show how this is reflected in the location of LME stocks for copper, lead, and zinc. The stocks shown below represent only “visible” LME stocks – no data are available on “invisible” stocks, i.e. metal kept off LME warrant. The yearly data refer to the financial year.

⁸ Stakeholder view

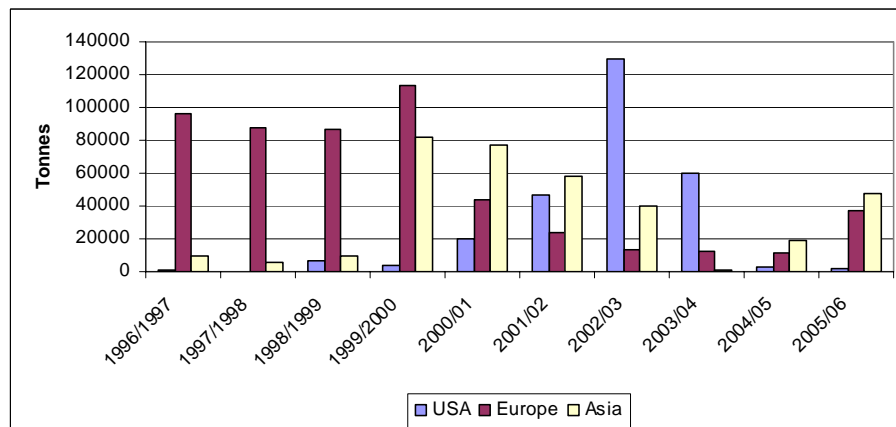
3.9 As Chart 3.4 shows that by 2005/6 there were almost no LME copper stocks in Europe or the USA (25 tonnes in Spain and 1,875 tonnes in the USA).

Chart 3.4: Geographical shift in LME Copper stocks 1996-2006



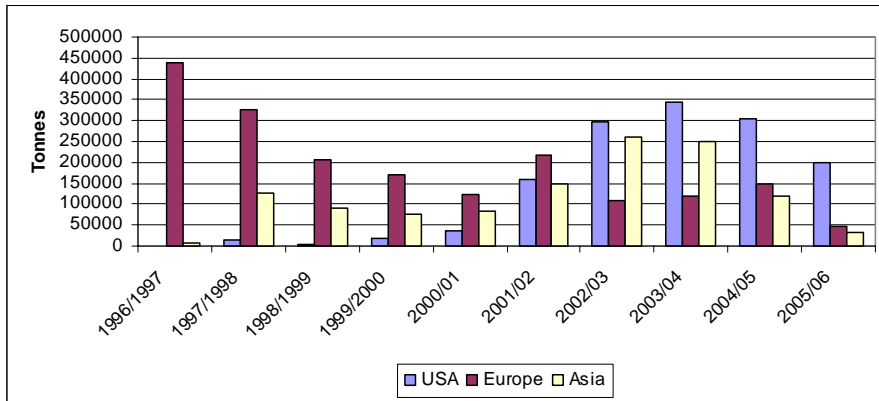
Source: LME and Europe Economics calculations

Chart 3.5: Geographical shift in LME Lead stocks 1996-2006



Source: LME and Europe Economics calculations

Chart 3.6: Geographical shifts in LME Zinc stocks 1996-2006



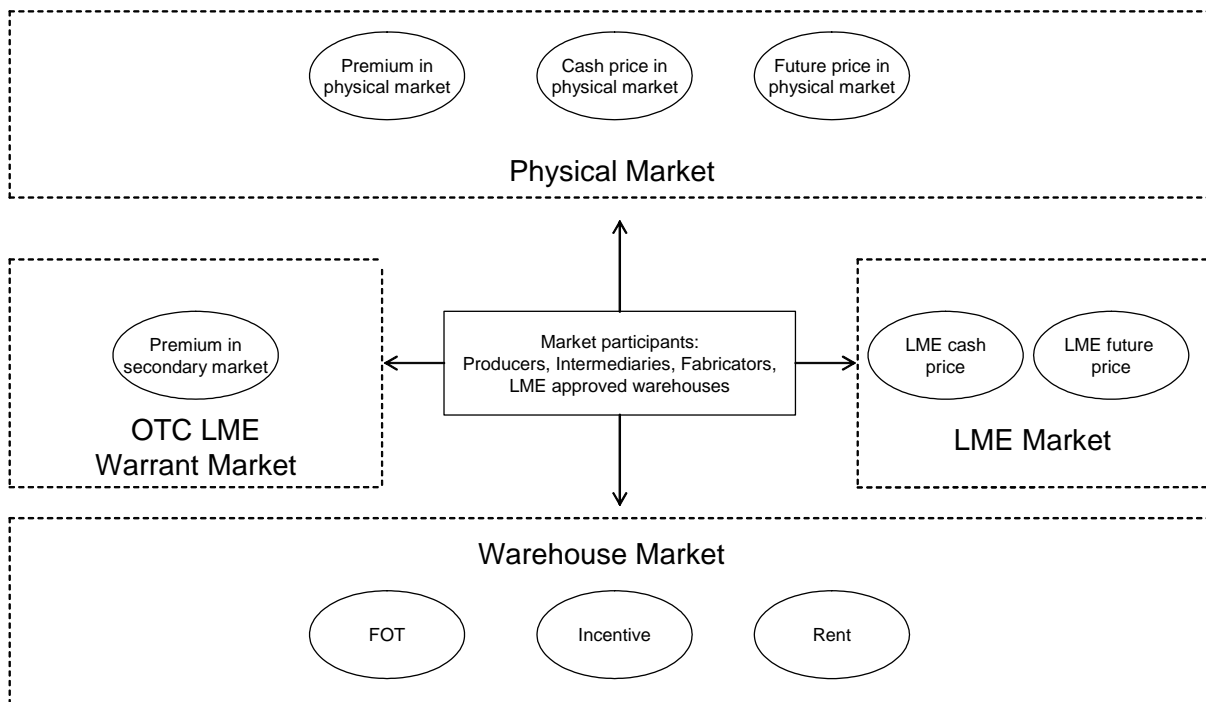
Source: LME and Europe Economics calculations

3.10 A table showing the ownership and geographic location of each LME-approved warehouse is included in Appendix B.

Relationships between the Metal Markets

3.11 Chart 3.7 below summarises the basic relationships affecting prices in the interlinked markets that constitute the global metals system. They apply to each of the metals that are the subject of this study.

Chart 3.7: Basic market relationships



Source: Europe Economics

- 3.12 As this relationship map shows, there are four main markets that make up the metals system: the LME market, the physical metals market, the Over-the-Counter market, and the warehouse market. Some participants operate in more than one of these markets, either simultaneously or at different points in the cycle. Each market has its own features, market structure and fundamentals, but the interdependence between markets means that in order to analyse the effects of a possible change in one market we need to have regard to likely consequences across the system.
- 3.13 Each market is now discussed in turn. We begin with the physical metal market, which from many perspectives is the most important part of the whole system.

The Physical Metal Market

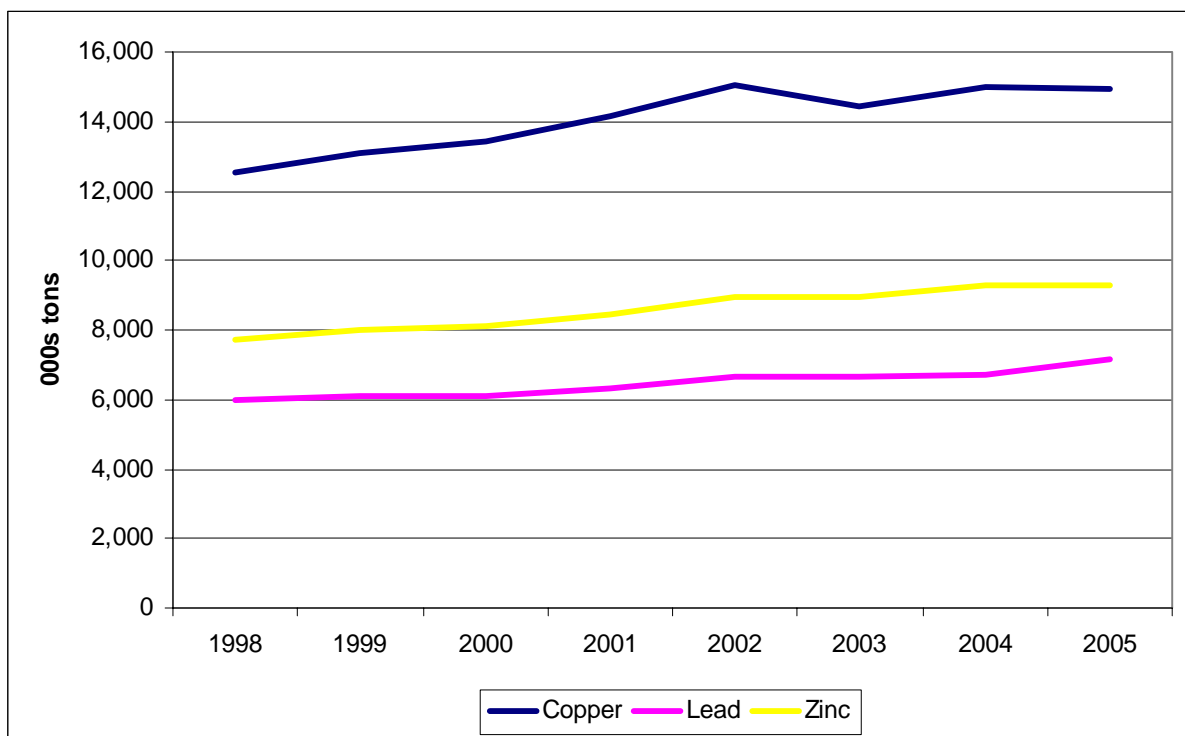
- 3.14 The majority of world metal trade takes place in the physical market, where fabricators purchase metal from merchants or directly from metal producers.
- 3.15 An investigation of the competitiveness of the physical metal markets would have been outside the scope of the present study. However, it is generally – though not universally – believed by stakeholders that the metal markets are largely competitive.
- 3.16 The production of copper is relatively fragmented. Codelco, the largest copper producer, produces 11 per cent of refined copper, a lower share of total refined copper, including processed scrap, and controls some 20 per cent of world copper reserves.⁹ The producers and fabricators of copper are, in the main, separately owned and there is very little vertical integration.
- 3.17 This contrasts with the production and fabrication of aluminium, a segment which is much more vertically integrated. The top three primary aluminium producers, Alcan, Alcoa, and Hydro Aluminium all produce both primary aluminium and fabricated aluminium products.
- 3.18 In the zinc market, it is said that 10 producers in the zinc market produce about 45 per cent of output.¹⁰ None has more than a 10 per cent market share. Umicore and Zinifex have announced their intention to establish a joint venture that would account for 11 per cent of the market. The third and fourth largest producers are known to work closely together and they jointly supply about 10 per cent of the market. China is important; in 2005, 18 Chinese smelters produced 1.31 million tonnes out of total Chinese output of 2.77 million tonnes. China's output has steadily expanded, and it now accounts for roughly 28 per cent of global zinc metal output.

⁹ http://www.codelco.com/english/la_corporacion/fr_corporacion.html
Codelco produced in 1.83m ton refined copper in 2005, while world production of refined copper metal was 16.52 million tonnes, according to International Copper Study Group.

¹⁰ This statement depends on how Chinese output is treated. If it is regarded as monolithic, the top ten have 58 per cent. China has 12.8 per cent, and the next 10 producers together have 47.5 per cent. Source: Raw Materials Group.

- 3.19 The structure of the lead market is arguably more concentrated but we understand from stakeholder consultations that there are no major competition concerns. Sixty per cent of lead is used in industrial batteries, and consumption is concentrated among a small number of large manufacturers. There has been some consolidation among producers with closures among small lead smelters. A constraint on price is the very large amount of lead that is re-cycled.
- 3.20 The chart below shows the world consumption of copper, lead, and zinc from 1998 to 2005.

Chart 3.8: World consumption of selected metals (1998-2005)



Source: CRU, LME, International Lead and Zinc Study Group, International Wrought Copper Council and Europe Economics

- 3.21 The volume of metal delivered for fabrication from LME approved warehouses is relatively small and in general less than 5 per cent of world metal consumption. Among the metals, a relatively high proportion of tin was delivered for fabrication from LME warehouses. Table 3.1 below shows the volume of metal delivered from LME-approved warehouses and the volume of world annual consumption for each metal.

Table 3.1: World Metal Consumption and Metal Delivery for Fabrication from LME Approved Warehouses (1998-2005)

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|
| Primary Aluminium | | | | | | | | |
| World consumption (000t) | 20,764 | 22,057 | 22,195 | 23,593 | 24,970 | 23,744 | 25,391 | N/A |
| Number of LME warrants in circulation* | 25,421 | 30,980 | 12,874 | 32,850 | 49,654 | 56,929 | 27,711 | 25,748 |
| Delivered out of warehouse (000t) | 468 | 370 | 715 | 513 | 499 | 836 | 1163 | 841 |
| Delivered out as a percentage of world consumption (%) | 2.3% | 1.7% | 3.2% | 2.2% | 2.0% | 3.5% | 4.6% | N/A |
| Copper | | | | | | | | |
| World consumption (000t) | 12,534 | 13,098 | 13,409 | 14,135 | 15,044 | 14,461 | 14,989 | 14,942 |
| Number of LME warrants in circulation* | 23,697 | 31,609 | 14,289 | 31,969 | 34,225 | 17,221 | 1,955 | 3,689 |
| Delivered out (000t) | 354 | 353 | 690 | 381 | 479 | 670 | 466 | 215 |
| Delivered out as a percentage of world consumption (%) | 2.8% | 2.7% | 5.1% | 2.7% | 3.2% | 4.6% | 3.1% | 1.4% |
| Lead | | | | | | | | |
| World consumption (000t) | 6,000 | 6,087 | 6,107 | 6,334 | 6,685 | 6,633 | 6,712 | 7,172 |
| Number of LME warrants in circulation* | 4,334 | 7,057 | 5,226 | 3,908 | 7,356 | 4,359 | 1,619 | 1,744 |
| Delivered out (000t) | 75 | 51 | 181 | 176 | 166 | 132 | 113 | 103 |
| Delivered out as a percentage of world consumption (%) | 1.2% | 0.8% | 3.0% | 2.8% | 2.5% | 2.0% | 1.7% | 1.4% |
| Nickel | | | | | | | | |
| World consumption (000t) | 929 | 982 | 1,008 | 1,074 | 1,124 | 1,117 | 1,171 | 1,250 |
| Number of LME warrants in circulation* | 10,994 | 7,827 | 1,613 | 3,198 | 3,662 | 4,012 | 3,483 | 6,007 |
| Delivered out (000t) | 55 | 51 | 52 | 22 | 39 | 70 | 49 | 42 |
| Delivered out as a percentage of world consumption (%) | 5.9% | 5.2% | 5.1% | 2.1% | 3.4% | 6.3% | 4.2% | 3.4% |
| Tin | | | | | | | | |
| World consumption (000t) | 246 | 250 | 249 | 251 | 275 | 277 | 279 | 290 |
| Number of LME warrants in circulation* | 1,636 | 1,831 | 2,577 | 6,110 | 5,122 | 2,895 | 1,632 | 3,345 |
| Delivered out (000t) | 28 | 27 | 25 | 18 | 38 | 32 | 33 | 24 |
| Delivered out as a percentage of world consumption (%) | 11.3% | 10.6% | 9.9% | 7.0% | 14.0% | 11.4% | 11.7% | 8.3% |

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|--|--------|--------|-------|--------|--------|--------|--------|--------|
| Zinc | | | | | | | | |
| World consumption (000t) | 7,722 | 8,006 | 8,136 | 8,451 | 8,966 | 8,966 | 9,307 | 9,296 |
| Number of LME warrants in circulation* | 12,682 | 11,154 | 7,791 | 17,334 | 26,042 | 29,592 | 25,145 | 15,742 |
| Delivered out (000t) | 362 | 177 | 212 | 124 | 302 | 226 | 430 | 417 |
| Delivered out as a percentage of world consumption (%) | 4.7% | 2.2% | 2.6% | 1.5% | 3.4% | 2.5% | 4.6% | 4.5% |

*: estimates calculated by dividing closing stocks by tonnes per warrant lot

Source: CRU, LME, International Lead and Zinc Study Group, International Wrought Copper Council and Europe Economics

The Physical Price

3.22 When metals are traded in the physical market, the price paid for a tonne of metal is known as the physical price, which, as is explained later in this section, is the sum of the LME price and the relevant physical premium. Buyers are willing to pay a physical premium over the LME price (the price paid for a warrant for metal on the LME) mainly because:

- (a) buyers save time and reduce transportation costs or save the costs associated with LME warrant swaps because in general producers and merchants selling directly deliver metal to locations that are convenient for, and agreed in advance with, buyers;
- (b) buyers avoid the transaction costs associated with buying metal through the LME, the main item of which is the FOT fee charged by the LME-approved warehouses;
- (c) buyers may sometimes get better financing terms from producers and merchants, whereas LME trades are expected to be strictly cash.

3.23 Physical premia are determined by the market and vary across region and cycle. In general producers set premia quarterly or annually.

3.24 Our working assumption for the purpose of this report is that the world metal markets (the “physical” markets) have competitive structures. By far the greatest share of trade is done through physical contracts, while purchases from LME (and other exchanges) for physical delivery account for a small though not insignificant share, depending on the stage in the cycle. It follows that the primary determinants of world metal prices are the supply and demand fundamentals, and expectations.

The LME

3.25 The London Metal Exchange (LME) has a current turnover of more than \$4,500 billion per annum. The LME now trades primary aluminium, aluminium alloy, North American special aluminium alloy (NASAAC), copper, lead, nickel, tin, and zinc. The LME also trades plastics, and plans to introduce trading in steel.

- 3.26 It is not necessary in a report to the LME to describe its functions at length, but for third party readers some further details are provided in Appendix 1. The essential economic features of the LME are that it is the pre-eminent world exchange for base metals, because of the value that participants attach to the services provided and to the network effect that any successful exchange generates: the more people use the exchange, the more useful the exchange is to users.
- 3.27 LME warrants are issued in respect of metal of specified standards deposited in approved warehouses, which are then contractually bound to deliver efficiently on demand. These warrants are therefore a most convenient basis for buying and selling metal, for spot and for future delivery. The obligation that warehouses must deliver means that metal producers, users and financiers can efficiently arbitrage between the warrants and other property rights in metal.

Roles and responsibilities

- 3.28 Thus the LME has three primary roles:
- (a) Pricing: the LME provides reference prices which are accepted globally and which are widely used in the non-ferrous metals and, to a lesser extent, in the plastics industries,
 - (b) Hedging: the LME provides a market where participants can protect themselves against risks arising from movements in base metals and plastics prices;
 - (c) Delivery: the approval and licensing of warehouse companies to house LME-warranted metal so that market participants may make or take physical delivery of approved brands of LME traded contracts.
- 3.29 Of these three roles, price discovery and hedging are often regarded by stakeholders as much more important than delivery, but the three roles are interdependent.
- 3.30 As a Recognised Investment Exchange (RIE), the LME is statutorily required to ensure that the market functions in an “orderly manner” and that investors are adequately protected. It is the responsibility of the LME to regulate the operation of the market, and that of the Financial Services Authority (FSA) to be responsible for the authorisation, regulation and conduct of business of the members of the LME.
- 3.31 The LME and its members are subject to a variety of regulatory controls and supervision by UK government agencies, as well as to directives formulated by the European Commission. They are also subject to rules relating to international trading applied by bodies such as the US Commodity Futures Trading Commission.

LME price

- 3.32 In the physical metal market, as we have discussed, prices are ultimately determined by supply and demand fundamentals, which may vary by location. The ready availability of transport and financial facilities means that prices are related to each other by arbitrage,

- with differences reflecting the cost of and time taken by the movements that would be necessary to prices to achieve equilibrium.
- 3.33 A global metal reference price is thus possible, and the LME has established itself as the provider of global reference metal prices for the metals traded on it. Price discovery is one of the most important functions of the LME.
- 3.34 The reliability of the LME price as a guide to the world physical price depends on two main conditions:
- (a) Physical delivery. All LME contracts are for physical delivery. The LME price will reflect prices in the physical market because market participants can readily arbitrage any price discrepancies between the LME price and prices in the physical market.
 - (b) A liquid and deep market. Trading turnover on the LME is generally very high. As an example, the turnover of copper contracts on the LME in 2005 was around 19 million lots (480 million tonnes), 31 times higher than world copper consumption in the same year (15 million tons). This liquidity and depth helps to ensure that the trades on the LME reflect real supply and demand conditions in the physical market very closely.
- 3.35 The liquidity of the market depends significantly on what is known as the “seller’s option”. When a bid is made for a warrant the purchaser does so in ignorance of the location of the lot to which the warrant refers. The seller is entitled to use any warrant in settlement of his contract. He will usually choose the “worst” warrants i.e. those in the most unattractive locations and of the lowest quality that meets LME specifications. The purchaser makes his bid in the knowledge that he is likely to receive the worst warrant; if he does not wish to take the metal covered by this warrant, it can be swapped in the OTC market for a premium against a warrant in a preferred location.
- 3.36 The term “LME price” is the term most widely used to refer to the cash seller and settlement price.
- 3.37 The LME price is thus not the price paid for delivered metal. The actual metal prices, or physical prices, are normally expressed in the form of the LME price plus physical premium determined, in turn, by regional differences in demand and supply plus differences in brand, location, etc.
- 3.38 The size of the LME advantage naturally depends on the efficiency of its own arrangements relative to that of its rivals. In summary, the services provided by the LME to the world metal markets allow participants to transact business more efficiently than would otherwise be possible. This margin of advantage over alternatives will benefit the different participants in the market according to the detailed arrangements between them.
- 3.39 Further information on the volatility of prices, on the stocks and trading levels, and on LME operational arrangements is provided in Appendix 1.

Other Metal Exchanges

- 3.40 Competition between exchanges of all kinds is increasing. Technological advance has driven an intensified search for economies of scale that has resulted in moves towards consolidation. Thus for example NASDAQ has proposed the takeover of the London Stock Exchange and there has been discussion of a merger between Euronext and the New York Stock Exchange.
- 3.41 Although the LME price remains widely accepted as the global reference price for metals, it faces potential challenges to its status from other commodity exchanges, some of which provide regional reference prices for some of the metals traded on the LME. The New York Mercantile Exchange is preparing to launch a metals contract, for US, European and Asian markets, that will only be traded electronically.¹¹ The LME has responded to competitive pressure by launching new forms of contract.

New York Mercantile Exchange (NYMEX)

- 3.42 The New York Mercantile Exchange, which claims to be the world's largest physical commodity futures exchange and the most important market for energy and precious metals, offers a wider range of contracts than the LME. These include futures, options and other derivative contracts for energy – crude oil, gasoline, heating oil, natural gas and electricity; metals – gold, silver, copper, aluminium and platinum; and soft commodities – cocoa, coffee, cotton and sugar.
- 3.43 The ease with which the markets can be arbitrated means that NYMEX prices are closely linked to the LME price. The liquidity of the NYMEX market for non-ferrous metals appears to be lower than that of the LME and prices on the New York market exhibit greater volatility than those in London.
- 3.44 Like the LME, NYMEX licenses warehouses in preference to operating them itself. The withdrawal of copper and aluminium, the only two metals commonly traded on both the LME and NYMEX, does not require the payment of an FOT charge from NYMEX warehouses. The contracts for copper and aluminium require that metal must be delivered to the receiver with handling and storage charges paid up to and including the day of delivery.

¹¹ *Nymex lines up metals trade battle*, Financial Times, 23 November 2006

Shanghai Metal Exchange (SHME)

- 3.45 The Shanghai Metal Exchange (SHME) was established in 1992 as a national exchange for non-ferrous metals futures. Listed contracts include copper, aluminium, lead, zinc, tin and nickel.
- 3.46 The SHME has 121 member companies, including major non-ferrous metals producers, consumers, commercial firms, import and export companies, and it provides reference prices for metal users and producers in China.
- 3.47 Some of those interviewed suggested that arbitrage between the LME and the SHME by SHME members was inhibited by the SHME's regulatory regime.

LME Approved Warehouses and Warehousing Charges

- 3.48 As explained above, every LME contract requires the possibility of physical delivery. This requirement is met by stocks held in LME-licensed warehouses around the world.¹² The warehouse market is outlined below and there is more detailed discussion in Appendix 1.
- 3.49 The relationship between the LME and warehouse companies is governed by the Warehouse Agreement which grants warehouse companies the right to issue LME warrants in respect of LME-grade metal or plastic stored in LME-approved warehouses. In return, the warehouse companies undertake certain obligations in relation to the metal and plastic they store and the warrants they issue.
- 3.50 Market activity has shifted over the last forty years away from the UK and from Europe. Consequently, there are now over four hundred warehouses in some thirty two locations covering the USA, Europe, the Middle and the Far East.

Warehouse charges

- 3.51 Potentially, LME approved warehouses could charge three main types of fee to warehouse users for metal on warrant:
- (a) in-charges
 - (b) rent; and
 - (c) the "free on truck" (FOT) charge.¹³

¹² In 'LME Warehousing: A Discussion Paper', the idea of de-linking warrants from specific lots of metal is discussed. Under this arrangement a warrant only gives entitled entitlement to a particular brand. This would, in all likelihood, lead to LME warehouses carrying lower stocks in relation to warrants. However, the Paper does not recommend this change (or discuss its consequences further).

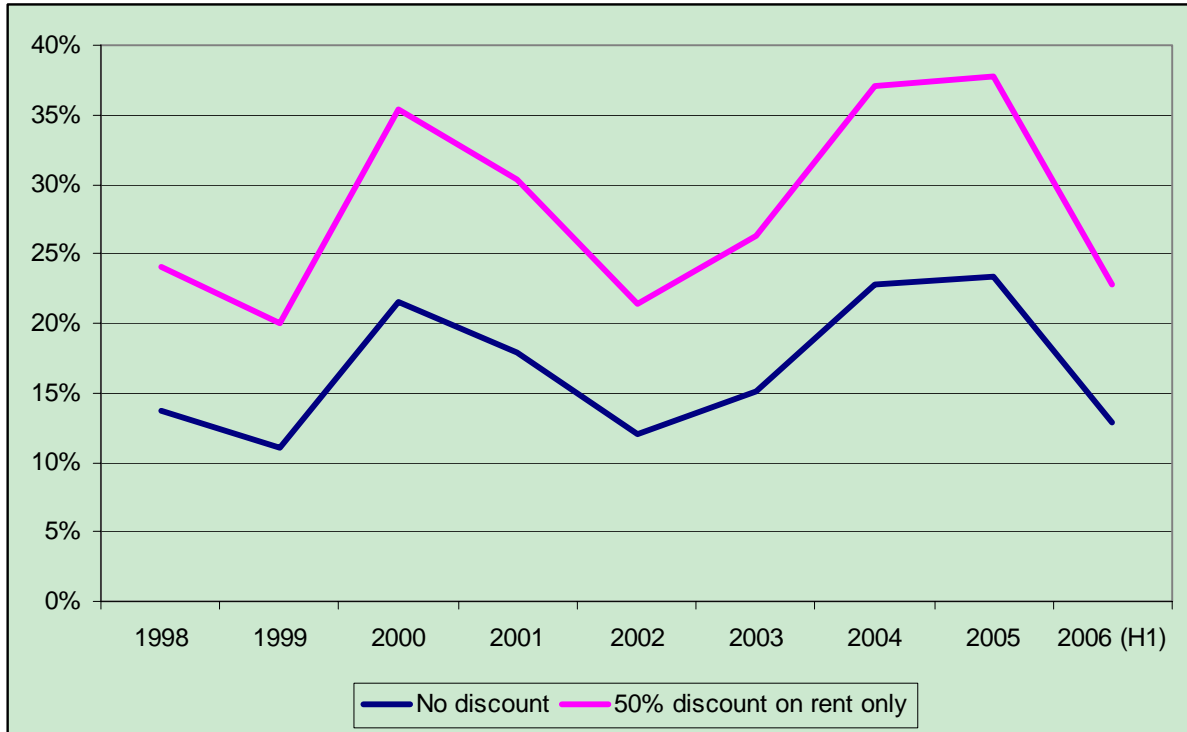
¹³ The term FOB is used for delivery free on board rather than on truck.

- 3.52 Warehouses may also provide ancillary services (e.g. freight, insurance, etc) and negotiate fees accordingly.
- 3.53 Rents are paid by successive owners of a warrant, based on the number of days that they have owned the warrant. For instance, if a merchant puts a copper lot on warrant and sells the warrant 20 days later to a copper fabricator, who withdraws the copper five days after purchasing the warrant, the merchant will be liable for 20 days' rent and the fabricator for 5 days.
- 3.54 FOT charges for metals are paid by withdrawers. Withdrawers of plastics do not pay FOT charges since the LME plastics contracts are on a "free on truck" basis.
- 3.55 There is no LME regulation that prevents warehouses from applying in-charges to depositors but these fees are not normally imposed; indeed, incentives are frequently offered in order to attract metal into the LME system.¹⁴
- 3.56 The requirement to publish the maximum rent and FOT rates was the outcome of a series of discussions between the LME and licensed warehouses in the late 1990s. In a Memorandum dated 19 June 1998 circulated to all LME listed warehouse companies and their agents, the LME clarified its concerns relating to FOT charges:
- "On the one hand the LME needs to preserve the integrity of LME Contracts and Warrants. Warrant holders should be aware of the charges they will have to pay to take possession of their metal; and those charges should be reasonable and should not artificially constrain the liquidity and elasticity of LME Warranted metal stocks.
- On the other hand, the LME is concerned that sufficient warehouse space is available at suitable Delivery Points and at reasonable rates. It is for this reason that the LME is concerned about potentially anti-competitive practices including the use of a dominant position of a Warehouse Company or a Member to try to reduce the number of competing warehouses available to store LME Warranted metal...the LME will take action against Members and Warehouse Companies which employ anti-competitive practices to the detriment of the LME's markets."
- 3.57 Following this memorandum, all listed warehouse companies were required to submit their maximum rent and FOT charges to the LME annually for publication. A three-month notice is needed if any warehouse wishes to change the published maximum rate.
- 3.58 We assume that (although, so far as we know, this has never happened) the LME would be entitled to cancel a warehouse's licence if it failed to give notice or posted an unacceptably large increase without reasonable justification.

¹⁴ The Complaint Officer's Report on the complaints made about warehouses stated that the practice of not charging for delivery in of metal for LME warranting has become almost universal in the last 25 years. Report of Investigation into Complaints made to LME about practices of LME Listed Warehouses, 15 February 2002.

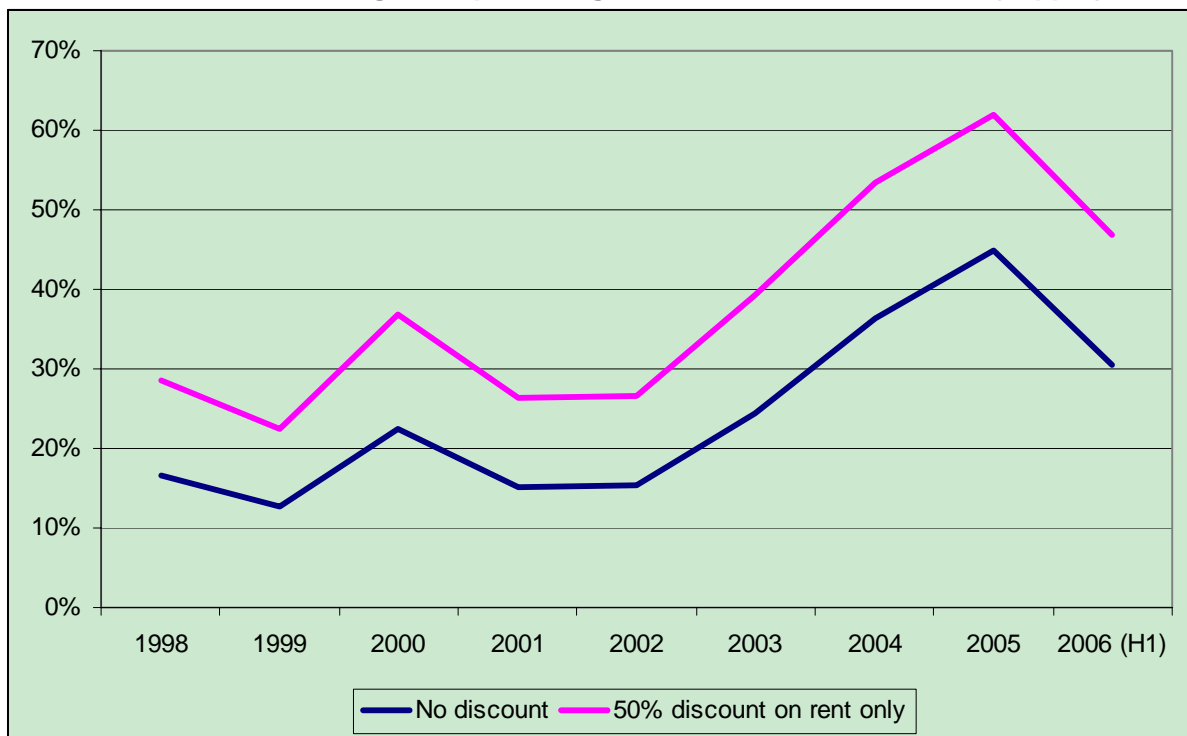
- 3.59 In a subsequent Memorandum dated 28 July 1998, the LME noted that:
- “The LME has been informed by the Warehouse Companies that the [FOT] charges do not include any additional costs incurred for stuffing containers, additional strapping and documentation beyond LME contractual requirements, or local taxes of a variable nature.”
- 3.60 The LME has been advised that it might be in breach of competition law if it attempted to set or regulate the maximum FOT charge. The LME discusses FOT rates submitted by warehouse companies solely on a bi-lateral basis, and in order to seek clarification and justification, as it sees fit, of the maximum FOT charges notified to it.
- 3.61 It is fundamental to an assessment of the effects of a possible change of contract that the warehouses face different competitive constraints with regard to the attraction of metal, the provision of storage services, and the provision of out-services. It is extremely rare for FOT charges to be discounted (and when this happens it is likely to be part of a larger arrangement). On the other hand, discounting of rents in response to competitive pressures is common, while customers bringing metal into the warehouse are far more likely to receive incentives than to be asked to pay in-charges.
- 3.62 According to our analyses, presented below, FOT charges potentially account for a large fraction of LME warehouse income.
- 3.63 We estimated LME warehouse rent and FOT income using annual LME stock data. The maximum potential rent income was calculated by multiplying average stock level (half the sum of opening stock and closing stock) with average published maximum rent rate. FOT income was estimated by multiplying metal outflow from LME warehouses by the average published maximum FOT rate.
- 3.64 We calculated two scenarios:
- (a) no discount: this assumes that warehouses offer no discount on either rent or FOT;
 - (b) 50 per cent discount on rent only.
- 3.65 We were informed during stakeholder consultation that warehouses rarely offer discount on FOT but may negotiate discounts on rents, depending on market conditions. The two scenarios illustrated could be read as the lower and upper bound of FOT income as a percentage of LME warehouse income.
- 3.66 It will be seen that there are periods in which FOT charges may generate over half warehouse income for some metals, and that they may well have generated about a quarter of income overall since 1998.

Chart 3.9: FOT charge as a percentage of LME warehouse income (primary aluminium)



Source: LME and Europe Economics calculations

Chart 3.10: FOT charge as a percentage of LME warehouse income (copper)



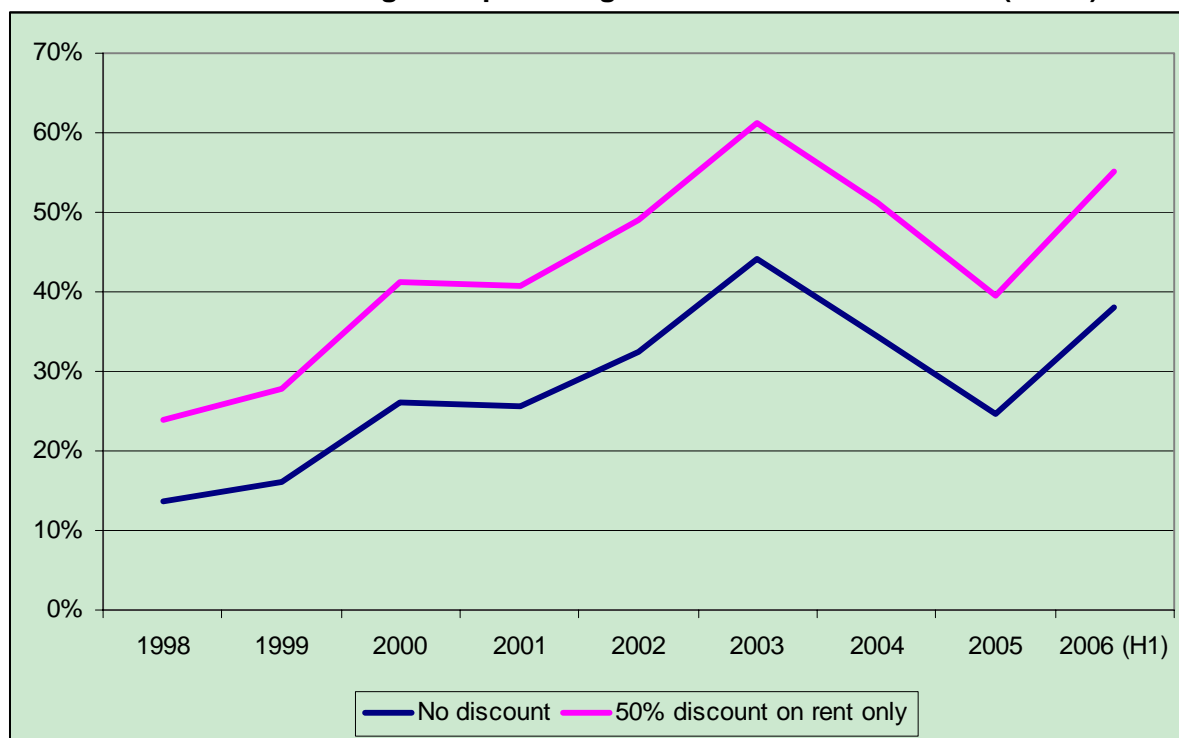
Source: LME and Europe Economics calculations

Chart 3.11: FOT charge as a percentage of LME warehouse income (lead)



Source: LME and Europe Economics calculations

Chart 3.12: FOT charge as a percentage of LME warehouse income (nickel)



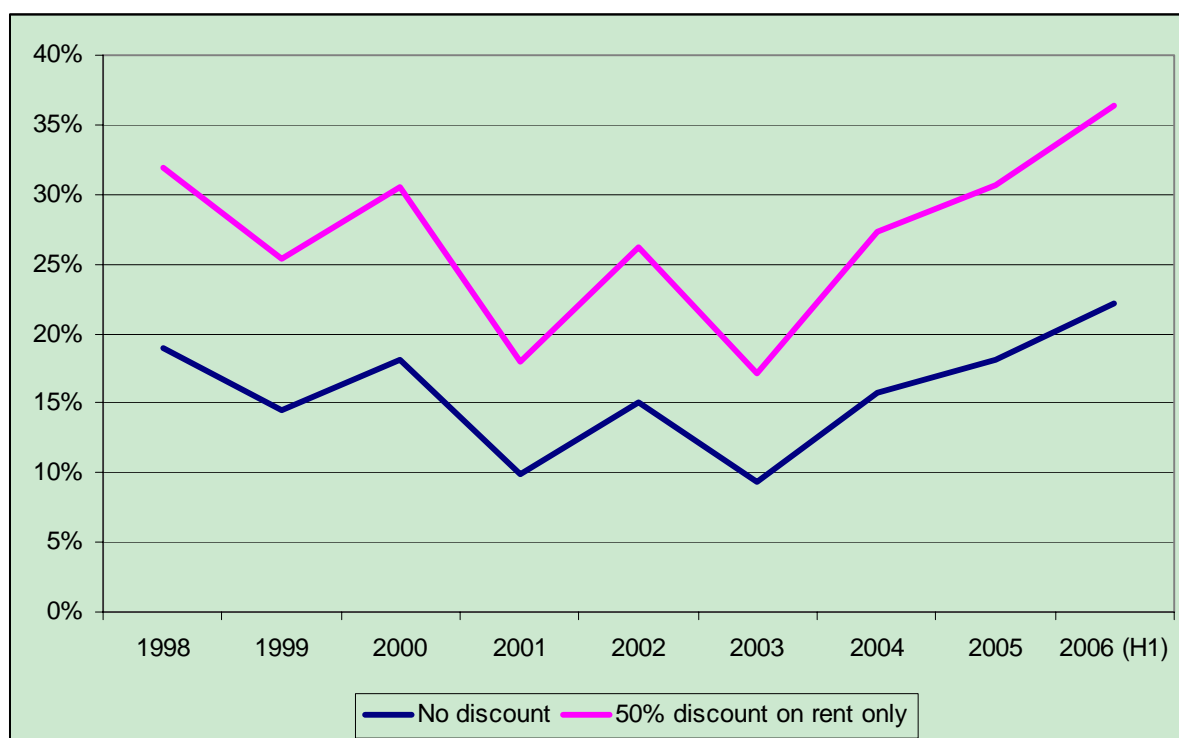
Source: LME and Europe Economics calculations

Chart 3.13: FOT charge as a percentage of LME warehouse income (tin)



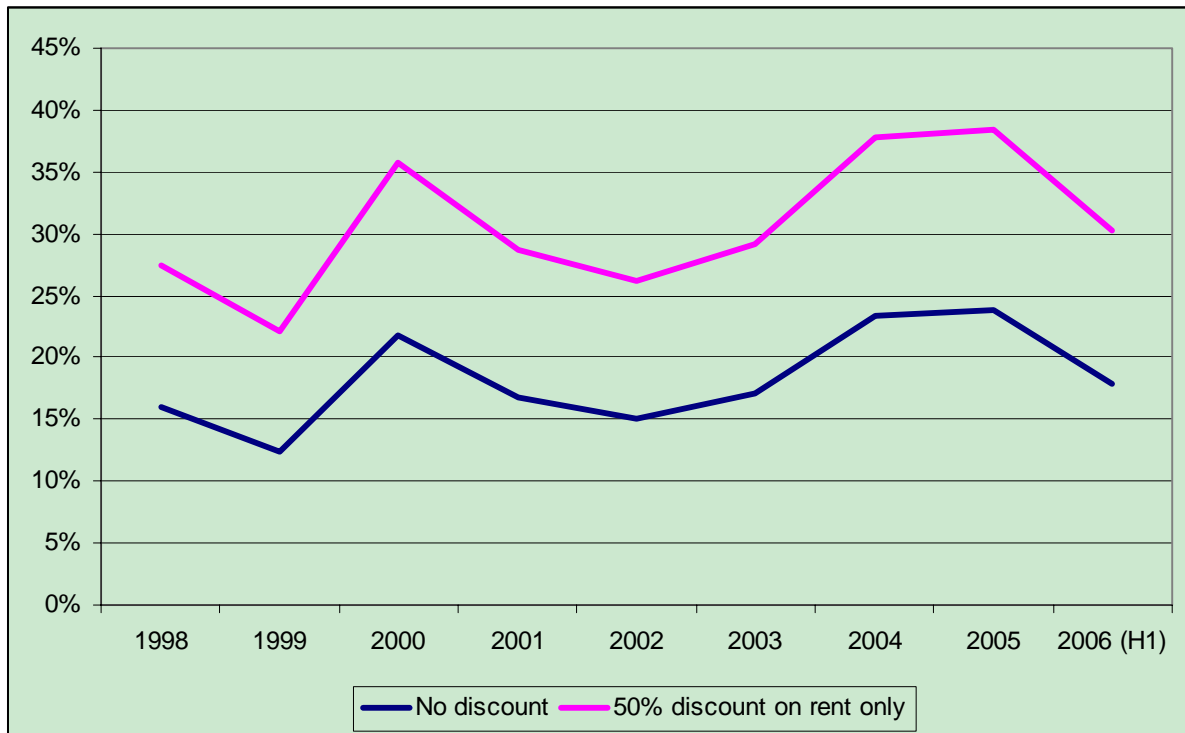
Source: LME and Europe Economics calculations

Chart 3.14: FOT charge as a percentage of LME warehouse income (zinc)



Source: LME and Europe Economics calculations

Chart 3.15: FOT charge as a percentage of LME warehouse income (all metals)



Source: LME and Europe Economics calculations

The OTC Market of LME Warrants

- 3.67 Under an LME contract a buyer is obliged to accept any LME warrant for the relevant metal or plastic as good delivery, and it is the seller, not the buyer, who has the choice over which warrant is actually delivered. This is known as the “seller’s option”. This practice provides the liquidity and depth necessary for a global market.
- 3.68 The buyer does not know what warrants he or she will finally receive but purchasers calculate that they will, typically, receive the “worst” warrant available to the sellers. This judgement is reflected in the price that they are prepared to pay.
- 3.69 A metal user who wants a particular warrant, for instance aluminium warehoused in Rotterdam, could go to a broker (normally an LME member), who will try to find someone with such a warrant for sale. If one is found then the warrant can be bought over-the-counter (OTC). In this way buyers can ensure that they acquire the warrant of the kind they want and in the location required. The broker takes a fee for this service and the seller normally secures a premium over the LME price. It is also possible to swap warrants over the counter, settling the merchant premium difference in cash.
- 3.70 Brokers sometimes “sift” the warrants they acquire on the LME. The “bad” warrants are used to meet LME trades, and the others are used to secure a premium over the counter. In some market situations it may pay a broker to launch a large sifting operation. When

the prices are right, positions are taken on the market so as to force a very large volume of warrants through the broker's hands enabling him to establish a portfolio of "best" warrants and to secure the premia on them. The financing needed for such warrant sifting depends on the number of warrants available on the market and the metal price, but generally the financing involved in such exercises ranges from several million to several hundred million dollars.

- 3.71 The transparency and liquidity of OTC trades are likely to be much lower than those on the LME, and as a result the premia and fees for such transactions are said to vary greatly. Nonetheless, our assumption is that these markets, like the associated financial markets, are competitive.

4 THE EFFECTS OF THE POSSIBLE CONTRACTUAL CHANGE

Introduction

- 4.1 The previous discussion has highlighted complex interrelationships between the markets to which the LME system belongs. We have seen that the great majority of metal trades take place on the physical market, at prices ultimately determined by market fundamentals, but that the facility which the LME provides for efficient arbitrage is of great value, not least in revealing the prevalent world price. We have noted the importance of the role of LME warehouses in facilitating arbitrage between the physical and financial markets.
- 4.2 In considering the likely effects of the possible change from 'in-warehouse' to 'FOT' it is necessary to take account of the particular institutional arrangements and market structures whose main features have been described. One must also consider the changes that will be taking place concurrently in world markets, quite apart from any possible change in this contract. Virtually all those consulted emphasised the importance of cyclical influences in the metal markets.
- 4.3 Our background assumption (the "counterfactual") is that the world economy will develop on the lines of conventional forecasts such as those by the OECD; and that the price of metals will fluctuate with changes in supply and demand conditions as they do at present.¹⁵ We further assume that, in the absence of a change in the warehouse contract, the LME will continue to face competition but will maintain its position as a pre-eminent exchange and source of credible reference prices.
- 4.4 To clarify further: if one were to conclude that the quantity of metal delivered into LME warehouses would fall as a result of the contract change, this means that it would fall *relative to the counterfactual* – i.e. compared with what would otherwise have been the quantity delivered into the warehouses.
- 4.5 As the likely effects are closely interrelated, a judgement is required about where to begin. We first consider implications of the possible change in warehouse contract for LME warrant prices. Only then do we move on to the question of premia, warehouse incomes, stocks, the effectiveness of the LME system and, ultimately, any likely influence on metal prices. These together cover the main issues identified in our Terms of Reference.
- 4.6 Our initial analysis is based on the assumption that, if the LME were to decide to implement the change discussed in this study, a way would be found of implementing the change; we go on to consider in Section 5 how the change might be implemented and some of the practical issues that would be involved.

¹⁵ To give just one illustration, the International Lead and Zinc Study Group forecast the lead cash price to average \$800 in 2007 and the zinc price to average \$3,128.

Effects on LME Warrant Prices

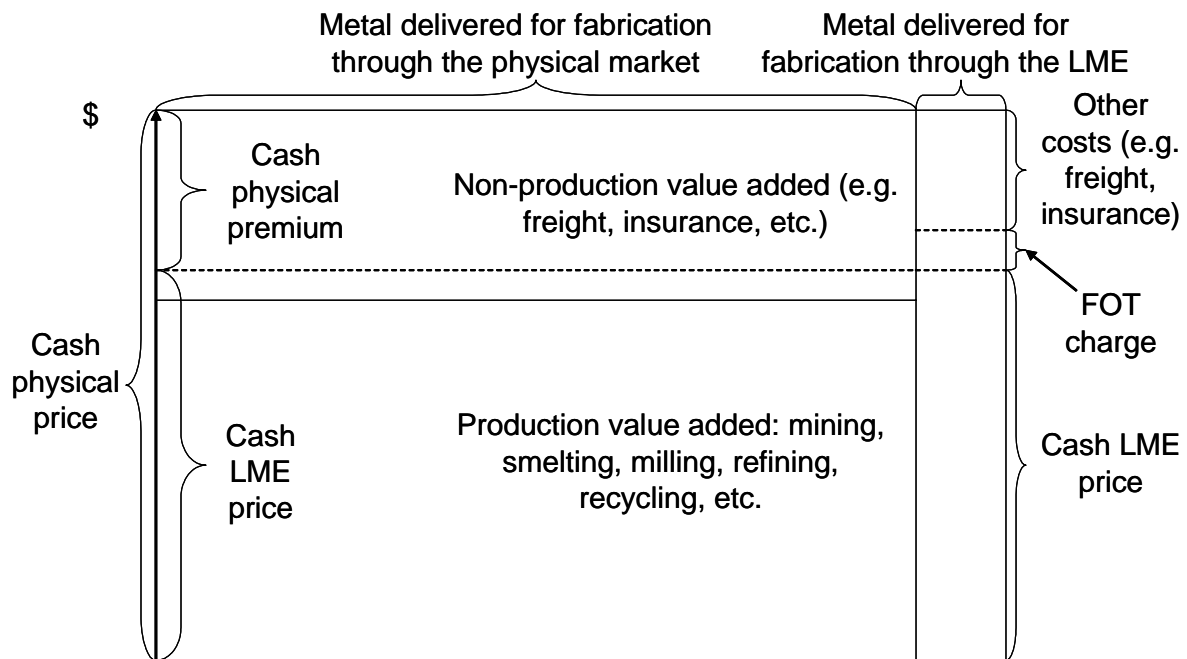
- 4.7 The removal of the FOT charge would add to the value of the warrant. It would do so because the warrant holder would no longer pay this charge, and so the value of the warrant would be increased for each potential warrant purchaser, by his estimate of the net present value of that future liability. This value would differ according to the warrant type, but all would be increased.
- 4.8 The same point can be expressed in other words by noting that after the change the warrants would be on an FOT basis not an “in warehouse” basis. The contractual change would be an alteration to the LME contract so that the warrant price includes the cost of delivering metal “free on truck.”
- 4.9 Even those purchasing warrants with the intention of trading them on will be influenced in their valuations by the knowledge that the final holders will no longer face the FOT charge. We can therefore be sure that there would be an increase in the value to purchasers; the demand curve for warrants would shift upward, putting upward pressure on the market price.
- 4.10 The likely size of the increase depends on any effects on the supply of warrants as well as the increase in their value to purchasers. The effects on the supply of warrants at any given price would develop over time, and depend on any consequences for the competitive position of LME warehouses, discussed below. Transferring the cost of FOT services to those placing metal in warehouse would discourage this decision, so that the long term supply of warrants would tend to be reduced.
- 4.11 There is therefore no doubt that the effect of the change would be to increase the price of warrants compared to what it would otherwise have been. It is not possible to be sure by how much, but initially it might well be by about the same order of magnitude as the FOT liability from which warrant holders would have been relieved.

Effects on Producer Premiums

- 4.12 There are two reasons why the contract change might lead to a reduction in producer premiums in the long term. Assuming no change in supply and demand fundamentals, and therefore no change in prices in physical metal markets, any rise in the LME warrant price resulting from a contract change (as discussed above) would have to be offset by a reduction in the physical premium.
- 4.13 This is illustrated in Chart 4.1 below which shows that since the cash physical price and the price of metal from an LME warehouse must be equal (because of arbitrage) the producer premium must also equal the sum of costs over and above the warrant price involved in obtaining metal from the LME warehouse. Thus the contract change, which moved the FOT into the LME warrant price, would be reflected by an offsetting decrease in producer premiums, all other things being equal.

4.14 A similar conclusion is suggested by considering the LME warehouse stocks as a competitive constraint on the producer premium that can be achieved. If the cost of this alternative is reduced by the contract change (the removal of the liability for the FOT charge from those withdrawing metal) then – other things being equal - a lower premium should be available.

Chart 4.1: The physical price, LME price, FOT charge, and physical premium



Source: LME and Europe Economics

4.15 However, as was often emphasised in stakeholder discussion, in the short term producers might well be reluctant to accept that there had been an increase in the LME price compared with what it would otherwise have been (and indeed such a reduction would be impossible to identify within the daily trading fluctuations of the LME price). Producers might therefore insist that premia should not be adjusted. They might argue that the FOT was never part of their premium and that in consequence there is no reason to lower it now the FOT is included in the LME price. Such arguments might or might not be sustainable in the long run, but we believe that they could be important in the period following the change.

4.16 It is also quite possible that a principal-agent problem would arise in some of these negotiations.¹⁶ It was suggested by some interviewees that producers' sales teams

¹⁶ This is an economic term which relates to one party (the principal) wishing to influence the behaviour of another party (the agent) in the presence of imperfect information and misaligned incentives. In this case, the principals would be the shareholders of the metal producers, and their agents would be the sales teams.

would prefer a combination of low price and high premium to a combination of high price and low premium, even if the sum of the latter were greater than that of the former. This is because bonuses are linked to negotiated premiums, not to the total price paid. If true, this is an added reason for scepticism about the likelihood of an early reduction in premia.

- 4.17 A potentially more important point for the long term would be the effects of any reduction in LME stocks, compared with what they would otherwise have been. Other things being equal, lower LME stocks would increase the ability of producers to charge higher premia. Although total world stocks might be the same, any diversion of stocks to non-LME storage would reduce market transparency and this might increase the ability of producers to achieve premia over the LME price. We consider the impact on LME stocks below.
- 4.18 The net effect of these conflicting forces on producer premia is uncertain. Our assessment is that they might reduce in the long term and on average, tending to offset the increase in the value of warrants, but that there could well be a significant period in which they were maintained. Even in the long term there could be situations in which tighter LME stocks led to premia being higher than in the counterfactual.

Effects on the Warehouse Market

- 4.19 LME warehouses provide services to three categories of customer, who may overlap but need to be distinguished. Firstly, the warehouses compete with each other and with alternative destinations for metal to be put on to warrant in the first place. The customer in this case is the depositor, who may be a metal producer, a merchant, a fabricator (with excess stocks) or any other party.
- 4.20 LME warehouses are able to attract metal from depositors through a combination of the advantages offered by the warrant, which is the focal point of the overall LME system, as well as by their own warehousing services. It is, however, frequently in their interest also to offer incentives to attract metal deposits. These incentives may take the form of payments, discounts, rebates of rent or prices for other services.
- 4.21 Secondly, warehouses provide storage services whilst the metal is in stock, charging rent for these services. The second category of customer is thus the warrant holder. Some warrant holders expect to pay the full rent, but others are able to negotiate discounts from the maximum rents notified to the LME. This reflects the fact that warrant holders are able to exert negotiating pressure, particularly if they are in a position to agree to keep metal in warehouse for a significant period. If there were to be a reduction in the attractiveness of LME warehouses relative to alternatives, the amount of metal for which rent could be charged would be reduced.
- 4.22 The third category of customer is those withdrawing metal. They are not usually able to negotiate discounts from the FOT charges. It would not usually be in the interests of a warehouse to discount the FOT charge, since this might result in metal being taken from

his warehouse in preference to others'. The warrant holder's entitlement is of course to a particular lot of metal, in a particular warehouse.

- 4.23 FOT charges are evidently set at a significant margin over short-run incremental costs of the specific services involved, and perhaps even above the long-run incremental costs of those services. These long-run costs include the financing of the investment involved and the costs of meeting LME requirements in terms of warehouse design, location, access and handling facilities.
- 4.24 Thus warehouses clearly face different degrees of competition in their dealings with depositors, non-depositing warrant holders (over rent) and those withdrawing metal. This fundamental feature of the warehouse market has enabled warehouse companies to make FOT charges a significant part of their income, and, as noted, to recover through these charges more than the short-run incremental costs of putting metal on to truck.
- 4.25 If warehouses are prevented from levying FOT charges from customers whose demand is (for these obvious reasons) less elastic than that of the other categories, it follows that warehouse income will fall.
- 4.26 It is unlikely that any increases in rent or other sources of income would compensate for the loss of FOT. Although reductions in incentives offered are to be expected as a way of recovering the FOT charge from those placing metal on warrant, it would not be in any warehouse's interest to take this too far. Customers deciding where to place metal have realistic alternatives. The incentives are not solely a means by which LME warehouses compete with each other; they are also a means by which LME warehouses as a whole compete with other warehouses and with the physical contracts.
- 4.27 The order of magnitude of the net fall in warehouse income will be strongly influenced by the stage of the metal cycle and the level of stocks at the time, but FOT charges clearly represent a significant part of warehouse income over the cycle as a whole. We estimate, based on stakeholder discussions, that, over the cycle and averaged between metals, this loss of warehouse income might be of the order of at least 20 per cent. The strong cyclical effects on warehouse stocks and throughput mean that the significance of the loss of FOT income would vary considerably around the long run average.
- 4.28 The reduction in net income would be less than the reduction in gross income to the extent that rents were increased or incentives reduced. The increased value of the warrant would create some scope for such changes. However, there would almost certainly also be a significant reduction in warehouse net income.
- 4.29 If this reduction in warehouse income were effectively the removal of excess profits (excess, that is, over the profits needed to retain the efficient amount of LME warehousing capacity) then it might represent an improvement in overall efficiency. However, this conclusion would only be valid if the long-run efficiency of the overall LME system were enhanced by the change.

- 4.30 The response of warehouses to any prolonged decline in revenue will vary from warehouse to warehouse and will depend in part on the importance to them of the LME component of their business. But the capacity of LME warehouses could be expected to be reduced and some marginal operators could be expected to withdraw from the business. This would adversely affect liquidity.

Effect on LME Stocks and Flows

- 4.31 The result of the reduction in warehouse income discussed above would include a reduction in the incentives offered, and as a result there would be a tendency for the amount of metal placed on LME warrant to be reduced. This effect would be ameliorated by the increase in the value of the warrant, which would go some way to compensate depositors for a reduction in the incentives they could expect. However, our assessment is that the net effect of these changes would be to deter deposits and reduce the attractiveness of LME warehouses relative to alternative destinations.
- 4.32 There is a further reason to expect that the contract change would lead to a reduction in LME stocks. The absence of a charge to those withdrawing metal would, other things being equal, increase the amount of metal withdrawn. It is worth emphasising that the change of contract would be equivalent to the imposition of a zero price on warehouses for exit services. As a result, the metal in LME warehouses would, at the margin, have been made easier to access, increasing the likelihood of withdrawal.
- 4.33 It is sometimes suggested that a reduction of warehouse incentives would rebalance total LME stocks into more appropriate locations, since fewer incentives would be available. However, the question of the optimal location and overall LME warehouse capacity is essentially separate from the possible contract change.

Effects on the Liquidity and Transparency of the LME System

- 4.34 If there are reductions in LME stocks relative to other less publicly visible metal stocks, this would reduce the liquidity of stocks (the effect on the liquidity of warrant trading would be much less).
- 4.35 This effect would be increased if there were an increase in the proportion of LME stocks that are illiquid as a result of financing deals. From the perspective of the warehouse, the removal of the FOT charge would be equivalent to a reduction in the expected time for which metal would remain in stock and on which rent could be charged; and it might be rational to respond by trying to negotiate commitments from depositors that metal would be held for agreed periods. Depending on the ability of depositors to respond, a change in the balance between liquid and illiquid LME stocks would result.
- 4.36 In considering whether the likely change in the level of LME stocks would throw into question the reliability of the LME warrant price as a guide to world metal prices, we note that the LME system is evidently able to provide reliable prices through very different stages of the cycle and associated stock levels. There is no close relationship between

physical stocks and the liquidity of the warrant market (which reveals the reference price). At the margin, however, a reduction in the LME stocks of metal would reduce transparency and affect liquidity.

Effects on Metal Prices

- 4.37 We have already underlined that fundamentals in the metal markets will be the most important long run influences on metal prices. However, as the preceding discussion indicates, there are a number of ways in which the contract change considered here might also have an influence.
- 4.38 The most important would be through a significant reduction in confidence in the LME system, stemming perhaps from a reduction in stocks, or possibly, in the longer term, a contraction of warehouse capacity; or perhaps from uncertainties associated with introducing the change. If as a result there were less resort to using the LME system, the costs and uncertainties of physical trades would increase, and forward cover and associated financing arrangements would be impaired. It is not possible to know whether average prices would increase or decrease; all we can say with reasonable confidence is that prices might become more diverse and volatile, trades would be less efficient and economic welfare would be reduced.
- 4.39 The second way in which metal prices might be influenced would be if the reduction in warehouse income were significant. If before the change the warehouses were making above-normal profits, a reduction would be analogous to (say) a reduction in transport costs, or other equivalent improvement in efficiency. However, even a substantial reduction from the perspective of warehouses would represent an extremely small percentage of overall metal costs.
- 4.40 Our discussion of warrant prices and of premia has shown that, despite changes to both, the effect of the contract change would not be to reduce prices across the board. Factors tending to increase prices would be the increase in the value of LME warrants, and perhaps the effect of reduced stocks in LME warehouses. Producers' premia might offset this increase in the long term, but this is not certain. The reduction in the liquidity and transparency of the system could tend to increase prices in the long run, compared to what they would otherwise have been.

Other Points

Effect on seller's option

- 4.41 No major effect is expected. The value of the sellers' option might be very marginally reduced by the extent of the FOT charge, since after the change sellers will not be able to differentiate between warrants with respect to exit charges.
- 4.42 The sifting of warrants might be facilitated, as the loss of one variable in the value of a warrant would make the value easier to calculate.

Operational effects

- 4.43 Assuming a smooth and satisfactory implementation of the change, no significant on-going operational changes would be required from user groups of the LME market or LME warehouses, although there would be some relatively minor one-off adjustments. However, if the change were to be implemented in a way that both “in warehouse” and “free on truck” warrants co-exist for some period after the change, there would be certain on-going costs for market participants in coping with a two-tier warrant structure. There would also be one-off adjustment costs (e.g. implementing new IT systems) for market participants, especially market players trading on the LME market. These might be significant.
- 4.44 Arrangements would be needed to ensure that bonds or some equivalent guarantees are in place to ensure that warrant-holders (who would have already paid for FOT in the price of their warrants) are protected in the case of warehouse bankruptcy.

Existing forward business

- 4.45 The impacts on existing forward business depend on the length of notice and how the change is implemented. None of the implementation options discussed in Chapter 5 are likely to have any significant effect on existing forward business.

Other considerations

- (a) Competition and other regulatory issues. It has been noted that changing the contract to FOT basis has the effect of reducing the price charged to those taking metal out of warehouse to zero. This raises the wider issue relating to the LME’s powers in respect of FOT charges.
- (b) VAT issue. Some interviewees have suggested that the VAT status of metal “in warehouse” and metal “free-on-truck” are different, which would lead to complications in implementation. This is a point on which legal advice may be required.
- (c) Geographical distribution of warehouses. In the programme of discussion, contradictory observations were made about the importance of the geographical distribution of warehouses. It was argued by some that warehouses are currently not distributed so as to match the geographical distribution of demand; and that this increases the incentive for warehouses to pay inducements for the deposit of metal in relatively inaccessible areas, thereby effectively reducing the supply of metal and distorting the market. It was argued by others that this was not the case and that the quantities of any metal involved were a very small fraction of the physical flow through the markets.

It was claimed that the maximum cost of freight from the most distant warehouse to any market was about \$120 per tonne and that the time involved was about twelve weeks; and that such distances and delays were untypical. There was general agreement that the efficiency of a warehouse in being able to deliver good volumes of

The Effects of the Possible Contractual Change

metal promptly was of fundamental importance and that most complaints about warehouses related to their operation rather than their position. Complaints were sometimes not pursued because of the effect of such action on relations with warehouses.

There was unanimous agreement that warehouses should not be sited away from areas of net consumption. The optimal location of warehouses has not been considered as part of this study but is an issue which some stakeholders believe the LME should again review.

5 IMPLEMENTATION OPTIONS

Introduction

- 5.1 This chapter discusses three options that the LME might adopt if it were to implement a change in the LME contract from “in warehouse” to “FOT basis”. These options are labelled: A, “Fading Out”, B, “Parallel Trading”, and C, “Big Bang”.
- 5.2 Any change will have consequences across the LME system affecting:
- (a) holders of existing LME warrants and contracts;
 - (b) prospective owners of LME warrants and other market participants;
 - (c) LME members acting as brokers;
 - (d) LME warehouses; and
 - (e) the LME itself.
- 5.3 The options discussed have a number of common features.
- (a) First, the LME announces the proposed change on a certain day (“A-day”), before which the market is assumed to have no firm knowledge or expectation of the timing and content of the change.
 - (b) Second, the LME announces that the change will be implemented on a certain day (“D-day”), after which all new LME warrants issued will be “free on truck”. D-day will take place after A-day – and the time lag is the length of notice.
- 5.4 The options discussed below have some basic differences in the way in which existing warrants would be treated, relating in particular to the question of whether owners of existing warrants would be required to pay FOT charges for those warrants.

The Options

Option A (“fading out”):

- 5.5 Under this option, the LME would announce that, from a certain date (“D-day”) 64 months out (one month longer than the length of the longest LME contract), all LME warrants will become “free on truck” and all new LME contracts entered into after the announcement with a prompt date after D-day will be on a “free on truck” basis. FOT charges will continue to be levied until D-day. All existing warrants which remain un-cancelled after D-day will be switched to a “free on truck” basis and not require the payment of FOT charge from either warrant holder or withdrawer. All warrants would be traded in the same way, at whatever prices emerged from the trading.

Option B (“parallel trading”):

5.6 The LME would announce that, from a certain date (much nearer than 64 months in the future), (“D-day”), all new LME warrants issued would be “free on truck”, and all new LME contracts entered into after the announcement with a prompt date after D-day would be on a “free on truck” basis. All “in warehouse” warrants and contracts would remain as “in warehouse”. The two types of contract would then be traded in parallel. The LME would allow both types of warrant to be used in meeting contractual obligations (i.e., “in warehouse” contracts could be settled by delivery of “free on truck” warrants and vice versa), but for the purposes of calculation, the two types of warrants (“in warehouse” and “free on truck”) would be treated differently by an amount equal to the FOT charge. Thus under this option, receivers of warrants under “free on truck” contracts would be entitled to pay only contract price minus FOT charge to be paid if they receive FOT unpaid warrants. Conversely, receivers of warrants under “in warehouse” contracts would be required to pay contract price plus FOT charges already paid if they receive a “free on truck” warrant.

Option C (“big bang”):

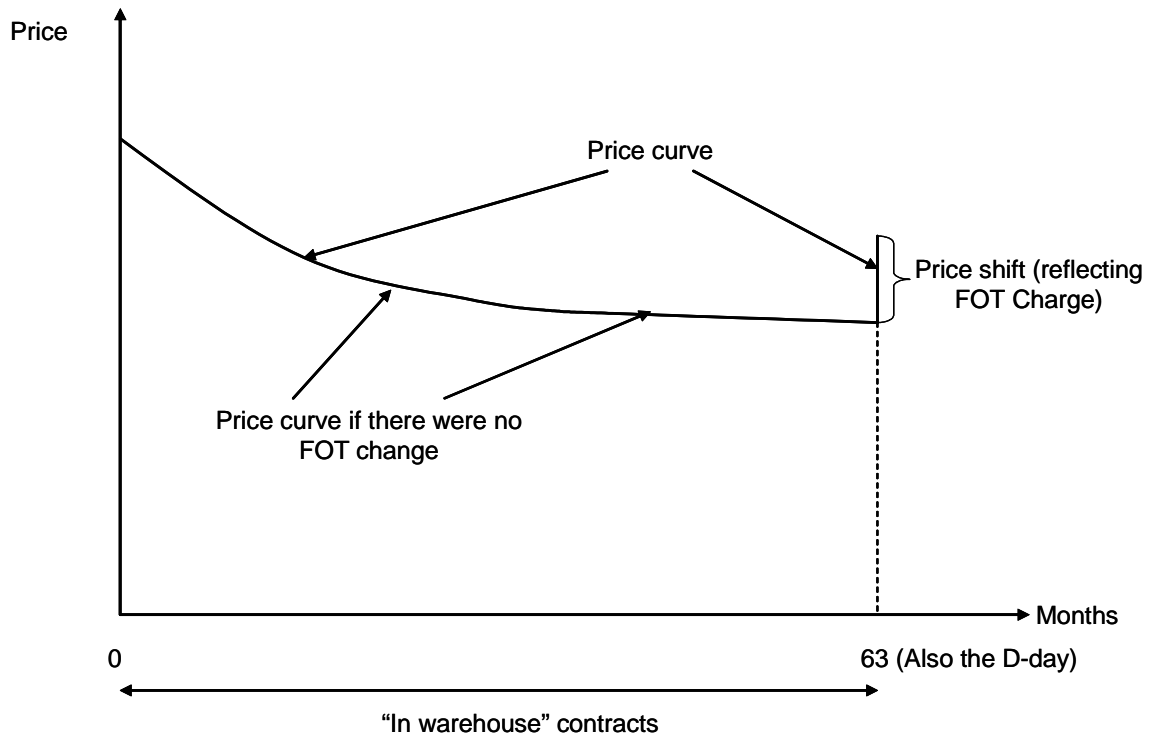
5.7 Under option C the LME would announce that, from a certain date in the future (“D-day”), all new LME warrants issued will be “free on truck” and all new LME contracts entered into after the announcement with a prompt date after D-day will similarly be on a “free on truck” basis. All owners of “in warehouse” warrants will be required to pay the FOT charges on D-day (if they do not volunteer to pay earlier) so as to convert their warrants onto the “free on truck” basis. All other LME contracts would remain on the “in warehouse” basis, and warrant receivers (including holders of long future contracts, buyers of call options and sellers of put options, etc) would be required to pay the prices agreed in the “in warehouse” contract plus FOT charges if offered “free on truck” warrants to settle contracts.

Discussion

Option A (“Fading out”)

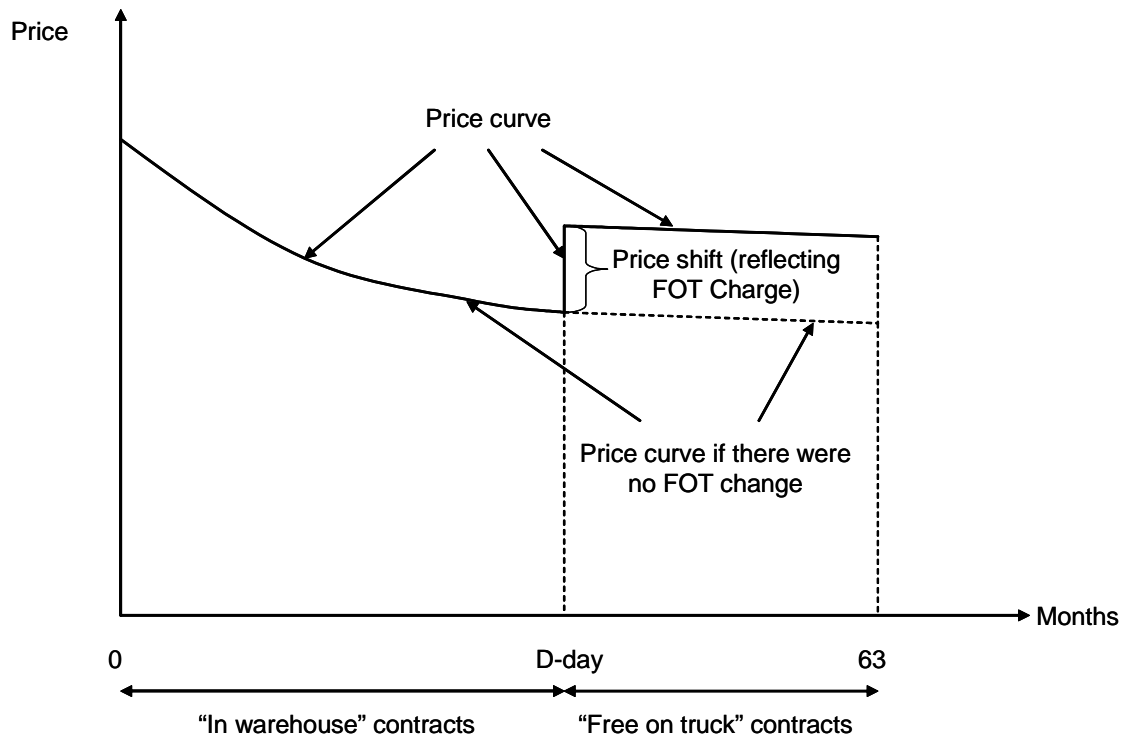
5.8 Under this option, initially the LME price curve would not change. However, as time passes, the far end of the LME price curve will be priced for “free on truck” contracts, and there will be a discontinuous movement upwards in the price curve by the amount of pre-change FOT charge, as shown in Chart 5.1 below. Initially the shift upwards will occur at the far (right) end of the price curve, then with the passage of time, more and more near prices will become prices for “free on truck” contracts and will shift upwards as well, as shown in Chart 5.2 below. On D-day, the LME spot price will also move up, completing the shift of the price curve, as shown in Chart 5.3 below. Note that this daily shift in the price curve is independent of normal price fluctuations.

Chart 5.1 The LME price curve when D-day is exactly 63 months away



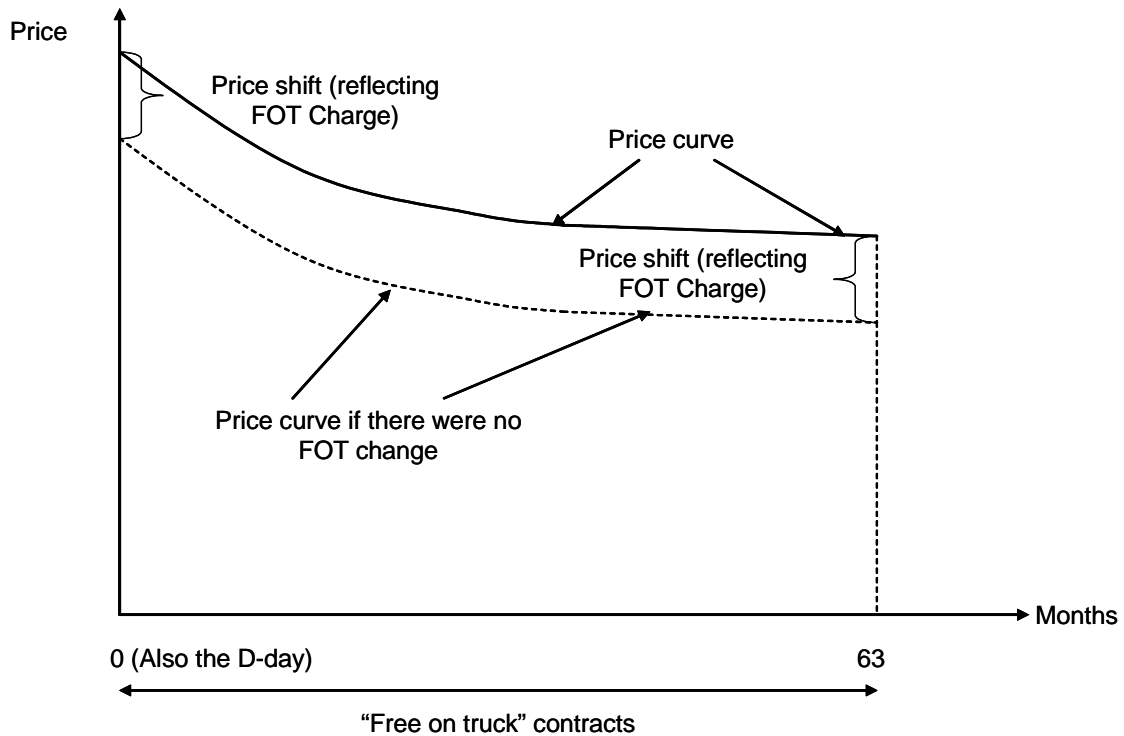
Source: Europe Economics

Chart 5.2: The LME price curve when D-day is less than 63 months away



Source: Europe Economics

Chart 5.3: The LME price curve on D-day



Source: Europe Economics

- 5.9 Although owners of existing “in warehouse” warrants would realise a windfall gain equal to the value of the FOT charge if they were to keep the warrant until D-day, the suggestion is that the 64 month period is so long that this effect would be minimal. Warehouses will suffer financial loss with every “in warehouse” warrant issued by them that is not cancelled before D-day, but again to a very small extent; they would have ample time to adjust their pricing policies.
- 5.10 The expected impacts on market participants would be:
- (a) Owners of existing warrants. They are unaffected if they cancel or sell their warrants before D-day, but will benefit if they hold existing “in warehouse” warrants after D-day as the warrants will be switched to “free on truck” at no cost to them.
 - (b) Depositors after D-day. They can expect to receive less net incentive when depositing metal on warrant but will be compensated by higher LME prices (the whole LME price curve would have completed its upward shift on D-day).
 - (c) Purchasers of warrants after D-Day. They would benefit from the higher certainty of the total cost of buying and taking metal out of warehouses, which would be the price of the “free on truck” contract.

- (d) LME brokers. They would be unaffected, except that in the short-term there might be more arbitrage opportunities for them while the market is still in the process of understanding the change.
- (e) Warehouses. They would have time to adjust their business models.
- (f) The LME. The LME might feel that the five-year phasing was excessive.

Option B (“Parallel trading”)

- 5.11 Under this option, “in warehouse” and “free on truck” warrants would be traded on the LME with prices differing by the amount of pre-change FOT charge. Buyers would have increased certainty about the total cost of buying and taking metal out of warehouses. This cost would be the price of the “free on truck” contract no matter what kind of warrant they received.
- 5.12 After the announcement, the whole price curve of prompt dates on or after D-day would shift up by an amount equal to the average pre-change FOT charge because on and after D-day LME prices would be prices for FOT paid warrants. As time passes, more and more near future prices will become prices for “free on truck” contracts and will shift up as well, as shown in Chart 5.2 above. On D-day, the LME spot price would shift up to complete the shift of the curve, as shown in Chart 5.3 above. Note that the shift of the price curve is independent of daily fluctuations in price.
- 5.13 The impacts on different market participants would be:
 - (a) Owners of existing warrants. There would be no impact, since they can either sell the warrant before the D-day or pay FOT charges to convert the warrant to “free on truck” on the D-day and sell the warrant at a higher LME price.
 - (b) Depositors after D-day. They would receive less incentive when depositing metal on warrant but would receive a higher LME price.
 - (c) Prospective buyers after D-day. They would need to pay the same amount of total money to purchase metal since they either buy an “in warehouse” warrant and pay the FOT charge or buy a “free on truck” warrant at a higher price. However, they would benefit from the higher certainty of the total cost of buying and taking metal out of warehouses, which would be the agreed price in the “free on truck” contract no matter what warrant they received.
 - (d) Sellers of existing future contracts with prompt date after the D-day. There would be no impact, since they could either deliver “in warehouse” warrants to settle the contract or deliver “free on truck” warrants and be compensated for the difference.
 - (e) Buyers of existing future contracts with prompt date after the D-day. There would be no impact, as they would either receive the “in warehouse” warrants that they are

entitled to in the contract or receive “free on truck” warrants and be compensated for the difference.

- (f) Buyers of existing call options and sellers of existing put options with expiry date after the D-day. There would be no impact on them, for the reasons given in (e) above.
- (g) Buyers of existing put options and sellers of existing call options with expiry date after the D-day. There would be no impact on them, for the reasons given in (d) above.
- (h) LME brokers. The effect on brokers would depend on whether the existence of two types of warrants generated more or less business.
- (i) Warehouses. They would need to calculate the terms on which new business would be done in the light of the absence of FOT charges on new warrants.
- (j) The LME. There might be some negative impacts on the LME, including potentially reduced business because of confusion among market participants and potential higher operational expenses needed to maintain two types of warrant during the transition period.

Option C (“Big bang”)

- 5.14 Under this option, every warrant, existing and new, would become “free on truck” on D-day.
- 5.15 After the announcement, the curve of prices with prompt dates after D-day would shift up because post-D-day LME prices would be prices for FOT paid warrants, as shown in Chart 5.1 above. As time passes, more and more near-future prices will become prices for “free on truck” contracts and will shift up as well, as shown in Chart 5.2. When D-day finally arrives, the LME spot price will shift up to complete the shift of the price curve as shown in Chart 5.3 above. Note again that the shift of the price curve is independent of daily fluctuations in price.
- 5.16 The impacts on different market participants would be:
 - (a) Owners of existing warrants. They would either sell the warrant before D-day or pay FOT charges to convert the warrant to “free on truck” on D-day and sell the warrant at a higher LME price. It is possible that they might suffer in as far as they are obliged to pay the FOT charge sooner than under the existing arrangements and this could worsen cash flow.
 - (b) Depositors after D-day. They would receive a smaller incentive when placing metal on warrant. However, they would be compensated by the higher LME prices (the whole LME price curve would shift up on D-day).

- (c) Prospective buyers after D-day. They would benefit from the higher certainty of the total cost of buying and taking metal out of warehouses, which would be the price of the “free on truck” contract.
- (d) Sellers of existing future contracts with prompt date after the D-day. There would be no impact, as they could either deliver “in warehouse” warrants to settle the contract or deliver “free on truck” warrants and be compensated for the difference.
- (e) Buyers of existing future contracts with prompt date after D-day. There would be no impact, as they would either receive the “in warehouse” warrants to which the contract entitles them or receive “free on truck” warrants and be compensated for the difference.
- (f) Buyers of existing call options and sellers of existing put options with expiry date after the D-day. There would be no impact on them, for the reasons given in (e) above.
- (g) Buyers of existing put options and sellers of existing call options with expiry date after the D-day. There would be no impact on them, for the reasons given in (d) above.
- (h) LME brokers. There would be no impact, except that in the short-term there might be more arbitrage opportunities while the market is still in the process of understanding the change.
- (i) Warehouses. On D-Day, warehouses will receive FOT payments earlier than expected.
- (j) LME. The market might itself be subject to some disruption although it could be less than under Option B since the period when there are warrants with different underlying contracts is more limited. Moreover, the LME would not need to maintain the trading of two types of warrant and operational expenses would be lower.

Summary

5.17 The differences in these implementation options are also summarised in Table 5.1 below.

Table 5.1: Differences between implementation options

| Options | A | B | C |
|---|----------|----------|----------|
| <i>Responsibility for paying FOT for existing "in warehouse" warrants</i> | | | |
| - warrant owners | | | X |
| - metal withdrawers | X | X | |
| - potentially no one | X | | |
| <i>Timing of payment of FOT for existing "in warehouse" warrants</i> | | | |
| - on D-day | | | X |
| - at the time of withdrawal | X | X | |
| <i>Two types of warrants after D-day?</i> | | | |
| - Yes | | X | |
| - No | X | | X |

5.18 If LME were to decide to implement the new form of contract, the practical problems could be overcome and the change implemented.

6 CONCLUSION

- 6.1 It is important to consider the likely effects of the possible change in contract in each of several markets as well as on the LME system as a whole.
- 6.2 We can be confident that, always comparing with the situation that would obtain in the absence of the contract change, the change of contract would increase the value of LME warrants. This might well be offset in time in the physical market by a corresponding reduction in producers' premia, leaving the final price to fabricators broadly unaffected, but we caution that the effects on producers' premia are uncertain and might take some time to be felt. Overall the effect of the contract change would not be to reduce metal prices.
- 6.3 The likely effects on warehouse income are not in much doubt. Income would fall, as the effect of the new contract would be to require warehouses to charge a zero price to those clients whose demand is least elastic – those cancelling warrants and withdrawing metal – and it is unlikely that any increases in rent or other reductions in incentives to those deciding whether to deposit metal in warehouse would compensate. Depositors and warrant holders have a stronger negotiating position than those cancelling warrants.
- 6.4 The response of warehouse companies to a decline in income is uncertain but it could lead to a reduction in LME warehouse capacity.
- 6.5 Although the increased value of LME warrants would increase the advantages of depositing metal in the LME warehouses relative to other options, it seems likely that this effect would be more than outweighed by the reduction in the direct incentives on offer, and as a result it is likely that there would be some diversion of metal away from the LME warehouses. Although the LME system is robust to a widely varying level of stocks through the cycle, at the margin a reduction in stocks would reduce transparency and affect liquidity.
- 6.6 We view the question of the optimal number, capacity and location of warehouses as a separate issue from that of the form of contract.
- 6.7 With regard to the ways in which a new contract could be introduced, if that is what LME decides to do, we have outlined three possibilities. Each would have some disadvantages, but these disadvantages could be overcome if the long run effects of the change were thought to be beneficial.

APPENDIX 1: THE LME SYSTEM

The LME

- A1.1 The London Metal Exchange (LME) has a current turnover of more than \$4,500 billion per annum. The LME now trades primary aluminium, aluminium alloy, North American special aluminium alloy (NASAAC), copper, lead, nickel, tin, zinc and plastics, and plans to introduce trading in steel.¹⁷
- A1.2 The LME is the pre-eminent world exchange for base metals. LME warrants are issued in respect of metal of specified standards deposited in approved warehouses, which are then contractually bound to deliver efficiently on demand. These warrants are therefore a convenient basis for buying and selling metal, for spot and for future delivery. The obligation that warehouses will deliver means that metal producers, users and financiers can arbitrage efficiently between the warrants and other property rights in metal.
- A1.3 A variety of market players are involved in the supply or demand of physical metal in the form of LME warrants. They can be broadly categorised as:
- (a) producers;
 - (b) fabricators;
 - (c) intermediaries (including merchants, traders, and brokers); and
 - (d) LME approved warehouses.

Roles and Responsibilities

- A1.4 The LME has three primary roles:
- (a) Hedging: the LME provides a market where participants can protect themselves against risks arising from movements in base metals and plastics prices;
 - (b) Pricing: the LME provides reference prices which are accepted globally and which are widely used in the non-ferrous metals and, to a lesser extent, in the plastics industries;
 - (c) Delivery: the approval and licensing of warehouse companies to house LME warranted metal to enable market participants to make or take physical delivery of approved brands of LME traded contracts.
- A1.5 These services are provided to LME members and through them to non-member clients.

¹⁷ The source for most information contained in this Appendix is the LME.

LME Membership

A1.6 The LME has a membership of approximately 80 firms of which 11 actively participate in ring dealing (open outcry). An additional 31 broker members also participate in the trading of futures and options through the telephone market and LME Select.¹⁸ Members of the LME may trade either as principals or as agents of their clients.

A1.7 The LME categories of membership are as follows:

- (a) Category 1 (ring dealing). Each ring dealing member is entitled to trade in the ring during the ring trading sessions. All ring dealing members, as members of the London Clearing House, are authorised under the 2000 Financial Services and Markets Act and are members of the FSA. Ring dealing members are Clearing Members who enjoy all the privileges of Membership including the right to issue client contracts and the exclusive right to trade in the Ring. They may also operate a 24 hour market by trading inter-office.
- (b) Category 2 (Associate broker clearing). Associate broker clearing members have all the privileges of ring dealing members except that they may not trade inside the ring. They also operate through the 24 hour inter-office market. They are members of both the London Clearing House and the FSA, authorised under the 2000 Financial Services and Markets Act.
- (c) Category 3 (Associate trade clearing). Associate trade clearing members may not issue client contracts or trade in the ring but they are entitled to clear their own business.
- (d) Category 4 (Associate broker). Associate broker members may issue LME contracts but are not members of the clearing house nor may they trade in the ring. They operate through the 24 hour inter-office market, and are members of the FSA, authorised under the 2000 Financial Services and Markets Act.
- (e) Category 5 (Associate trade). Category 5 members have no trading rights except as clients of a member of a higher category.

LME Contracts and Physical Delivery

A1.8 LME contracts are traded on the exchange. A number of conditions are attached to LME contracts, of which the most relevant for this study are:

¹⁸ LME Select is the exchange operated electronic trading platform. Member firms are connected to the system which allows accredited traders to execute trades electronically. The system allows trading on all LME contracts, futures, options, traded average price options (TAPOs), and carries.

- (a) all contracts must be for the delivery of the relevant metal or plastic on a prompt date (the term used for the settlement or delivery date);
- (b) the metal or plastic to be delivered must conform to specifications set out by the LME in its Special Contract Rules, which govern matters such as quality, shape and weight;
- (c) the metal or plastic must be one of the brands listed and approved by the LME;
- (d) the metal or plastic must be held by one of the LME listed and approved warehouse companies and for which the warehouse company has issued a bearer receipt in the form specified for an LME warrant; and
- (e) metal and plastic delivery obligations are satisfied by the transfer of a warrant from seller to buyer. The warrant is backed by a specific parcel of material, a requirement not peculiar to the LME as a commodity exchange.¹⁹

A1.9 Unlike metals, plastics on LME warrant cannot be withdrawn from an LME warehouse and then put on warrant again elsewhere.

A1.10 Although the bulk of the LME contracts are closed out by an opposite contract instead of actual transfer of warrants, any party to a contract can still insist on using the actual transfer of warrant to settle the contract if they so wish.²⁰ The possibility that an actual lot of metal could be physically delivered helps to ensure that the LME price is effectively the equivalent of metal prices in the physical market.²¹

A1.11 The physical delivery of metals and plastics is achieved through the transfer of LME warrants.²² By holding an LME warrant, the bearer holds the equivalent of a warehouse receipt for a specified lot of metal/plastic in an LME approved warehouse, issued by the warehouse after the metal/plastic has been delivered to it. An LME warrant confers ownership of the underlying metal subject to the payment of all the legitimate charges owed to the warehouse. The warrant refers to a specific lot of metal/plastic of a defined quality and brand in a specific location. Once a warrant holder wishes to withdraw

¹⁹ For instance COMEX has this as well.

²⁰ For instance, Party A and Party B enter into a one-month contract for certain amount of copper (e.g. five lots) with price of say \$1,000/lot where Party A longs (buys) the metal and Party B shorts (sells) the metal. Three days before the prompt date (delivery date) of the initial contract, these two parties could agree to enter an equal and opposite contract for settlement on the same day, which means that the two parties enter into another three-day contract where Party A would deliver to Party B the same amount of copper as specified in the initial contract (e.g. five lots) with price say of \$900/lot on the same prompt date of the initial contract. Thus the physical delivery obligations of these two contracts are equal and opposite, and there is no need to actually conduct physical delivery. These two contracts are thus settled by one party paying the net cash difference of these two contracts to the other party, which in this case is $(\$1,000 - \$900) \times 5 = \$500$ and paid by Party A to Party B.

²¹ The LME Warehousing Discussion Paper does briefly discuss the possibility of the LME "de-materialising" so that LME contracts will be settled instead financially. However, such de-materialising would, it is argued, place the LME in a minority of globally traded physical futures contracts. The LME system has been designed to meet the requirements of the metal industry and thus any changes not originating from the user base is regarded as damaging the LME's relevance. The paper concludes that de-materialisation and abolishing the warehouse system are not practicable propositions.

²² Technically speaking, the term 'physical delivery' may refer to the delivery of warrants (e.g. "the underlying asset"), rather than actually withdrawing metal from warehouses.

metal/plastic, he or she can present the warrant to the warehouse where the metal/plastic is stored, and the warrant will be cancelled before the metal/plastic is delivered out.

A1.12 While all LME contracts provide for physical delivery of metal, the LME is generally seen as a place of supply of last resort for physical metal, and metal users normally purchase metal directly from producers or merchants in the physical market. Metal withdrawn from LME warehouses each year generally accounts for less than five per cent of annual world metal consumption.

LME Price

A1.13 Price discovery is one of the most important functions of the LME, which provides the global reference metal price.

A1.14 In the physical metal market, prices are determined by regional supply and demand and these vary greatly by location. However, the availability of transport and financial facilities means that these prices are related to each other through arbitrage by the cost of and time taken by the movements that would be necessary to achieve price equilibrium.

A1.15 The LME has established itself as the provider of global reference metal prices for the metals traded on it, despite the fact that the majority of world metal is traded on the physical market where metal users purchase metal directly from producers or merchants.

A1.16 The reliability of the LME price depends on two conditions;

(a) Physical delivery. As explained above, all LME contracts are for physical delivery, and cannot be settled until the prompt date. Market participants can thus readily arbitrage any price discrepancies between the LME price and prices in the physical market.

(b) A liquid and deep market. Trading turnover on the LME is very high. This helps to ensure that the trades on the LME reflect the real supply and demand conditions in the physical market, and that the possibility of market manipulation is minimised.

A1.17 The LME publishes the following official LME prices daily for each metal:

(a) cash buyer;

(b) cash seller & settlement;

(c) 3-months buyer;

(d) 3-months seller;

(e) 15-months buyer;

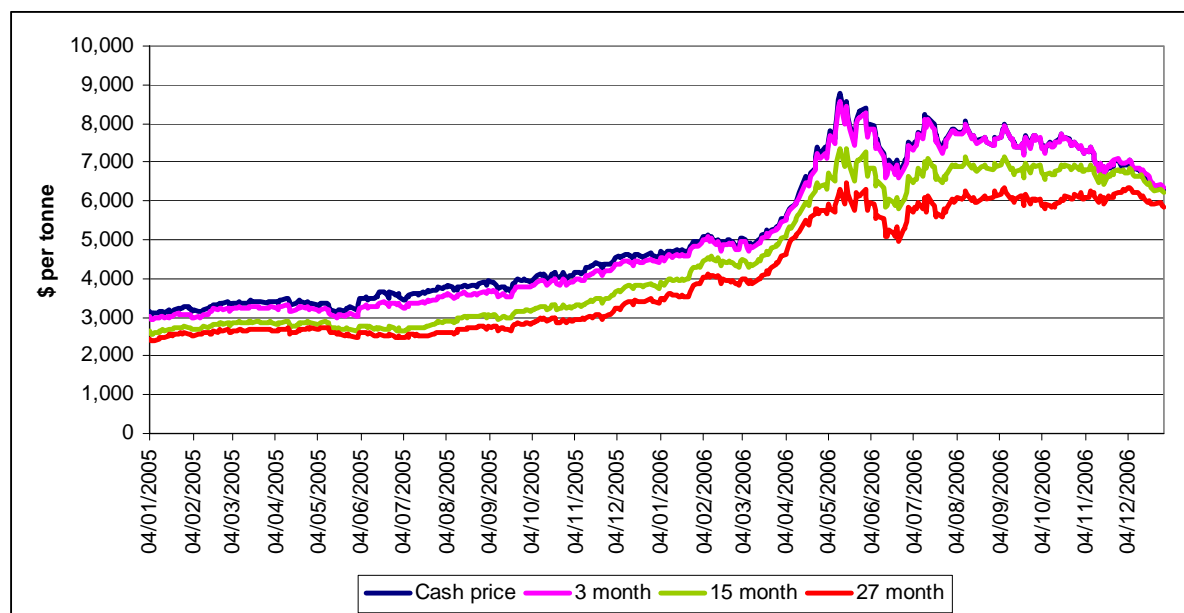
(f) 15-months seller;

(g) 27-months buyer; and

(h) 27-months seller.²³

A1.18 The graph below shows how these prices compare, for example, for copper.

Chart A1.1: Comparison of cash, 3 month, 15 month and 27 month prices for copper (2005-2006)



Source: LME

A1.19 The term “LME price” can refer to any of these prices or to all of them as a whole, depending on the context and purpose. However, the term is most widely used to refer to the cash seller and settlement price.

A1.20 The LME price is thus not the actual price paid for delivered metal – the LME price is the price of a warrant, and the reference price for metal prices around the world. The actual metal prices, or physical prices, are normally expressed in the form of the LME price plus physical premium or discount determined, in turn, by regional differences in demand and supply, differences in brand, location and, in the case of ore or concentrates, processing costs.

London Clearing House

A1.21 London Clearing House (LCH).Clearnet is the LME's contracted central counterparty clearing house. It clears LME contracts throughout the London business day.

²³ The LME does not publish 27-months official prices for lead and tin.

Operation

- A1.22 An LCH.Clearnet clearing member enters into a future or option contract with another clearing member. Both sides of this trade are input into the computerised matching system, which then feeds the information to LCH.Clearnet. Assuming both parties' entries agree on time of trade, price, prompt date, contracting parties and volume, the trade is accepted as matched. The single buy/sell contract is split by LCH.Clearnet into two separate buy or sell contracts between itself and each of the clearing members respectively, enabling it to take responsibility for contract performance.
- A1.23 Non-clearing members' and clients' contracts with clearing members are not affected by clearing; they remain principals' contracts.
- A1.24 LCH.Clearnet takes on counterparty risk (e.g. the risk that one party of the contract defaults on its contractual obligations) when it accepts trades into clearing, and it covers that risk by requiring payment of margin - amounts that cover the extent of any losses a contract might show. LCH.Clearnet looks at all the positions of a clearing member when calling margins, since a clearing member may have some positions in profit and others in a loss situation, and calls margin on the basis of the clearing member's net position. Margins may be provided in cash or by other collateral such as bank guarantees.

SWORD

- A1.25 SWORD is an automated software system used by the LME to keep a record of warrants.²⁴ It was designed to replace the physical movement of warrants from one holder to another.
- A1.26 SWORD can be accessed by its users, either on their own account or on behalf of their clients. Warrants registered on SWORD can be transferred centrally and this simplifies the trading procedure.
- A1.27 SWORD impacts upon the life of a warrant in the following way:
- (a) when metal is deposited in an LME warehouse (this might be metal that was already in a non-LME warehouse or has come direct from the producer/merchant to an LME warehouse) the warrant is issued by the warehouse's London Agent and is registered and held on SWORD.
 - (b) the SWORD system tracks the rents and ownership of the warrant as it changes hands and calculates the rents by reference to the rate published by the issuing warehouse. Note that SWORD does not record trades; it only records the transfer of the ownership of warrants.

²⁴ SWORD is co-owned by London Clearing House

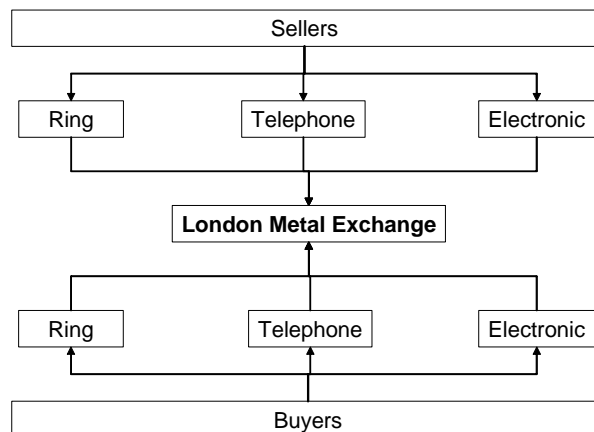
- (c) SWORD records the cancellation of the warrant prior to physical delivery of the product out of the warehouse.

Trading on the LME

A1.28 Trading on the LME, as shown in the chart below, takes one of three forms:

- (a) open outcry market (ring trading), which is attended by representatives of the LME ring dealing firms;
- (b) inter-office telephone market, which is a 24 hour global market place transacted between member companies over the telephone;
- (c) LME Select, which is the LME's electronic trading platform.

FigureA.1: Forms of Trading on the LME



Source: LME

A1.29 Through most of its history, the main users of the LME and those trading on it were metal producers, recyclers, fabricators, and metal merchants, all of whom were involved in the physical metal market.

A1.30 In recent years, many financial investors, such as banks, pension funds, and hedge funds, have also started trading on the LME.

A1.31 Traditional LME brokers are mostly also metal merchants in the physical market who, in the past, have provided ancillary services for metal producing and fabricating firms directly involved in the metal trade. These brokers have seen their relative importance in the LME

market decline as purely financial traders have entered the market. Interviewees in general agree that the latter category now makes up the bulk of LME trades and exerts considerable influence in determining the LME price.²⁵

Price Volatility

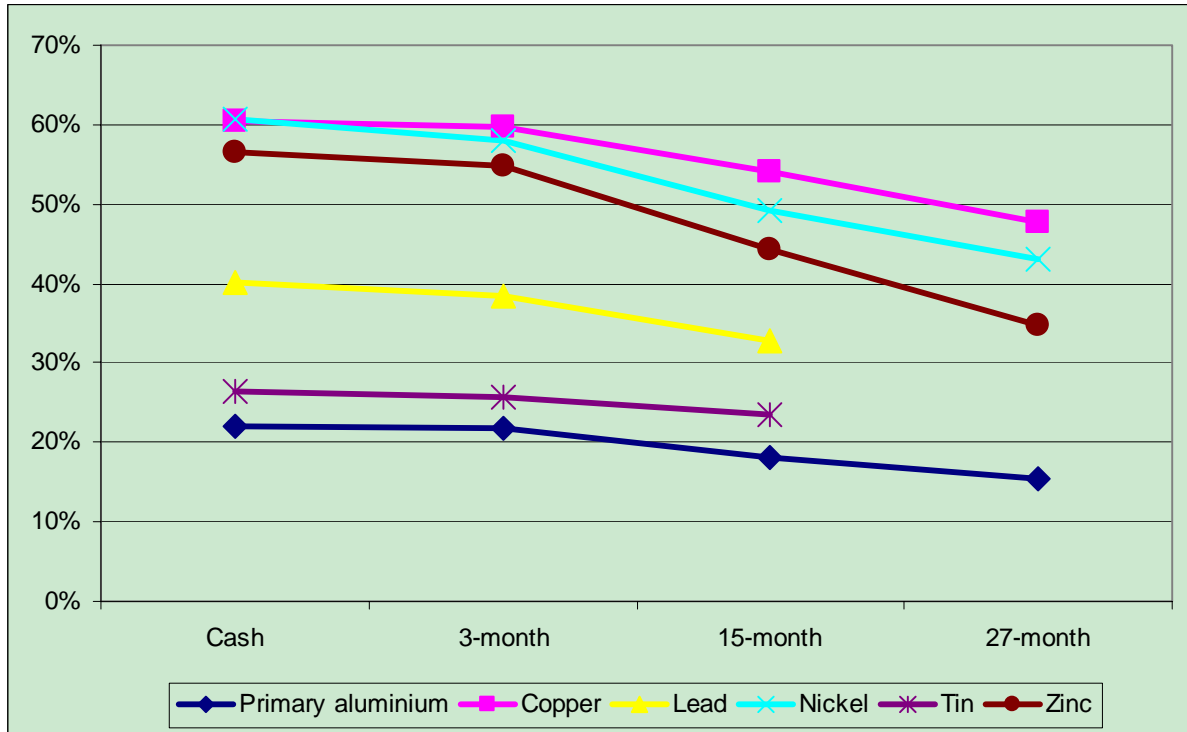
A1.32 Price volatility is an inherent characteristic of most or all commodity markets and stems from the way these materials are produced and consumed. On one hand, any substantial increase in production levels often takes a long time to implement, and may require incremental investment; on the other hand, consumers (e.g. in the case of metals fabricators or other metal users) have a limited choice of substitutes and substitution itself may require investment. This means that neither supply nor demand is responsive quickly to a change in price and large price swings are required to balance changes in production or demand.

A1.33 Chart A1.2 and Table A1.1 below show a more detailed picture of the volatility of official monthly average LME prices over the past 10 years. It can be seen that prices are very volatile. Between 1996-2006, the maximum prices of copper and nickel (for example) were several times higher than the minimum prices, and the standard deviation, the parameter most frequently used to measure volatility, is more than 40 per cent of the average price for the period.²⁶

²⁵ The divide of LME trades between traditional brokers and new financial traders was suggested to be 20:80 by one stakeholder.

²⁶ Standard deviation is defined as the spread of the values from the mean value.

Chart A1.2: Volatility of LME price (1996-2006): standard deviation from average



Volatility defined as standard deviation of LME prices as a percentage of average LME price

Source: Europe Economics

Table A1.1: Volatility of Monthly Average LME Price (1996-2006)

| | Cash | 3-months | 15-months | 27-months |
|-------------------------|-------------|-------------|-------------|-------------|
| Aluminium | | | | |
| Maximum price | \$2,861.48 | \$2,881.38 | \$2,708.57 | \$2,512.62 |
| Minimum price | \$1,181.96 | \$1,204.28 | \$1,278.78 | \$1,333.91 |
| Mean price | \$1,616.81 | \$1,632.28 | \$1,633.11 | \$1,619.00 |
| Standard deviation (SE) | \$355.52 | \$354.97 | \$297.47 | \$249.19 |
| SE/Mean price | 22% | 22% | 18% | 15% |
| Copper | | | | |
| Maximum price | \$8,045.86 | \$7,905.24 | \$6,904.55 | \$6,129.32 |
| Minimum price | \$1,377.28 | \$1,399.76 | \$1,460.09 | \$1,499.57 |
| Mean price | \$2,526.89 | \$2,499.56 | \$2,364.04 | \$2,266.84 |
| Standard deviation (SE) | \$1,526.40 | \$1,494.25 | \$1,279.76 | \$1,079.15 |
| SE/Mean price | 60% | 60% | 54% | 48% |
| Lead | | | | |
| Maximum price | \$1,725.50 | \$1,685.13 | \$1,508.42 | |
| Minimum price | \$412.12 | \$428.80 | \$463.00 | |
| Mean price | \$680.03 | \$677.64 | \$663.89 | |
| Standard deviation (SE) | \$272.50 | \$260.30 | \$217.15 | |
| SE/Mean price | 40% | 38% | 33% | |
| Nickel | | | | |
| Maximum price | \$34,570.26 | \$33,792.37 | \$28,252.63 | \$24,646.05 |
| Minimum price | \$3,875.00 | \$3,941.82 | \$4,173.18 | \$4,366.82 |
| Mean price | \$9,900.76 | \$9,788.94 | \$9,071.07 | \$8,508.97 |
| Standard deviation (SE) | \$6,013.02 | \$5,681.37 | \$4,461.15 | \$3,667.61 |
| SE/Mean price | 61% | 58% | 49% | 43% |
| Tin | | | | |
| Maximum price | \$11,158.68 | \$11,033.16 | \$10,482.11 | |
| Minimum price | \$3,694.50 | \$3,735.50 | \$3,882.25 | |
| Mean price | \$6,027.84 | \$6,023.54 | \$5,988.71 | |
| Standard deviation (SE) | \$1,590.64 | \$1,551.04 | \$1,403.14 | |
| SE/Mean price | 26% | 26% | 23% | |
| Zinc | | | | |
| Maximum price | \$4,405.39 | \$4,320.50 | \$3,746.79 | \$3,259.32 |
| Minimum price | \$747.60 | \$768.21 | \$814.10 | \$832.00 |
| Mean price | \$1,251.65 | \$1,262.01 | \$1,239.10 | \$1,199.10 |
| Standard deviation (SE) | \$706.87 | \$692.15 | \$547.88 | \$416.88 |
| SE/Mean price | 56% | 55% | 44% | 35% |

Source: LME and Europe Economics

Stocks and Trading

A1.34 The LME publishes daily reports on the stocks of metal stored in LME warehouses, and such information is widely used by market participants to infer supply and demand conditions and therefore to help to form their views on the LME price. Among these reports are statistics of warrants that have been cancelled, but not yet withdrawn from warehouses. The percentage of such cancellations to total stocks is shown in the table below.

Table A1.1: Cancelled tonnages

| Metal | Warrant cancelled as a percentage of closing stocks (%) | | | | |
|-------------------|---|-------|-------|-------|-------|
| | 1998 | 2000 | 2002 | 2005 | 2006* |
| Aluminium Alloy | 2.79 | 1.47 | 8.01 | 2.25 | 5.64 |
| Copper | 23.65 | 11.29 | 4.06 | 15.26 | 9.27 |
| Lead | 2.35 | 5.28 | 7.23 | 7.53 | 3.05 |
| NASAAC | - | - | 4.77 | 2.57 | 1.86 |
| Nickel | 3.14 | 10.33 | 10.48 | 15.92 | 17.76 |
| Primary Aluminium | 5.48 | 7.71 | 5.28 | 11.97 | 7.19 |
| Tin | 9.79 | 5.76 | 7.02 | 7.33 | 16.22 |
| Zinc | 3.19 | 3.04 | 3.84 | 9.49 | 36.08 |

*: Up to July 2006

Source: LME and Europe Economics calculations

A1.35 The table below summarises the percentage of cancelled warrants as a proportion of total warrants traded.

Table A1.2: Average cancelled warrants as a proportion of total volume traded (1998-2006)*

| Metal | % |
|-------------------|------|
| Aluminium Alloy | 0.38 |
| Copper | 0.10 |
| Lead | 0.14 |
| Nickel | 0.22 |
| Primary Aluminium | 0.10 |
| Tin | 0.37 |
| Zinc | 0.14 |
| NASAAC | 0.21 |

* June 2006

Source: Europe Economics calculations

APPENDIX 2: LME APPROVED WAREHOUSES

- A2.1 While the prime concern of the LME is with prices and market stability, given that all warrants are for physical delivery, it is also concerned with the physical side of the system, the LME licensed warehouses. If warehouses do not operate effectively and efficiently there may be adverse effects on the integrity and validity of LME pricing. LME warehouses are the first and last points of contact between the physical market and the market for warrants.
- A2.2 The LME itself does not operate its own warehouses, but approves and licenses warehouse companies to house LME warranted metal and it is the warehouses that issue warrants through their agents in London.²⁷

Criteria to be Satisfied by an LME Approved Warehouse

- A2.3 Warehouses seeking to house LME warranted metal must meet certain criteria. These were set out in a memorandum to all members, warehouse companies, agents, listed producers and other interested parties dated 24 November 2003, and took effect from February 2004.
- A2.4 These criteria were designed so as to ensure that a warehouse company is financially sound and capable of satisfactorily operating a warehouse to LME standards. LME requirements include the submission of:
- (a) published accounts;²⁸
 - (b) company particulars such as lists of directors, staff, address, etc.;
 - (c) details of general facilities available for warehousing; and
 - (d) details on security and insurance systems
- A2.5 In addition, LME warehouses are required to have a London agent, to comply with SWORD and to follow certain procedures for processing warrants. The relationship between the LME and the warehouse companies is governed by a standard contract.
- A2.6 Thus it is ensured that each LME approved warehouse will meet the required standards of working practices and facilities. These include the ability to handle a minimum daily tonnage as set out in the following table.

²⁷ However, past discussions have mooted the possibility of the LME running or franchising its own warehouses – see for example LME Warehousing: A Discussion Paper

²⁸ Although in practice this is often an extract from a balance sheet to show that the company showing it meets capital requirements.

Table A2.1: Minimum daily tonnage requirements

| Warehouse company's authorised space per location, in square metres | Minimum daily delivery tonnage for all metals |
|---|---|
| 2,500 | 800 tonnes |
| 5,000 | 1,200 tonnes |
| 7,500 | 1,500 tonnes |

Source: LME

- A2.7 For each 2,500 square meters of space there must be a minimum of two doors per warehouse for loading and unloading.
- A2.8 Approved warehouses are subject to spot audits of stocks and systems by LME inspectors in order to ensure good warehouse - keeping practice.
- A2.9 An LME warehouse must also meet certain freight facility requirements. These include:
- (a) a road connection to major highways;
 - (b) rail loading facilities adjacent to the warehouse if the LME believes this service is routinely required at that location; and
 - (c) water loading facilities adjacent to the warehouse if the LME believes this service is routinely required at that location.
- A2.10 This last requirement is considered by some stakeholders to be sometimes impracticable. Waterside locations are prime sites and, as such, are expensive and in principle difficult to come by. Some dock authorities also require firms to purchase rather than to lease warehouses, and this again raises waterside warehousing costs.

Warehouse Locations

- A2.11 In 1960, there were 10 approved LME warehouse locations, all of which were in the UK. While the number of locations expanded steadily through the 1960s and 1970s, it was not until 1987 that the first non-European warehouse was licensed in Singapore. The LME now has over 32 locations in Europe, North America, Asia and the Far East. This reflects the change in the geographical configuration of the metal markets in the last 50 years. The LME, unlike NYMEX, does not have any licensed locations in South America primarily because this is an area of net production. The LME will only approve new locations if there is an expressed demand for them and then only if such locations meet its requirements.

A2.12 In November 2003, the LME published amended policy and guidelines for the approval of good delivery points.²⁹ The general policy for a new location is summarised in the following three statements:

For any particular LME contract metal to be deliverable therein, the location should be an area of net consumption and away from adjacent areas of production for that particular metal.

The Delivery Point should already be, or be genuinely believed to be capable of becoming, a natural, logistically sound conduit for the passage of metal on to eventual consumption points.

The location should be considered safe, well managed, politically and economically stable, commercially sensible, fiscally appropriate, legally sound and not subject to corruption.

A2.13 The requirements are flexibly applied and allow for case-by-case exceptions.

A2.14 The table below summarises areas of net consumption for different metals.

²⁹ See LME Memorandum to all members, warehouse companies, London agents, listed producers, and other interested parties of 24 November 2004.

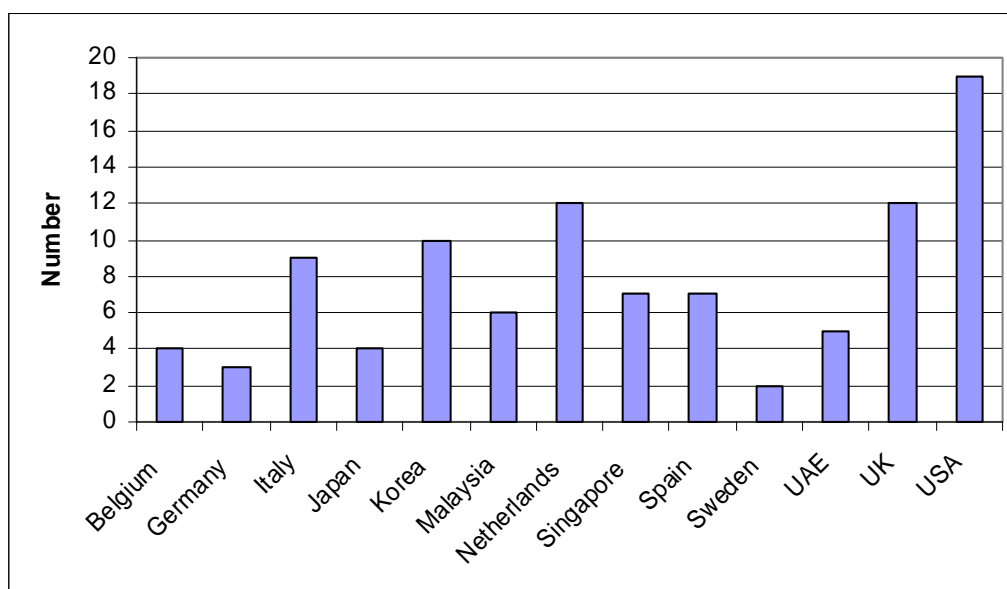
Table A2.2: Selected Areas of net consumption (000t)

| Metal | Location | Net consumption | | |
|-------------------|-----------------|-----------------|-------|-----------------|
| | | 2000 | 2004 | 2008 (forecast) |
| Tin | Offshore Europe | 16.1 | 11.4 | 13.3 |
| | NW Europe | 29.5 | 31.0 | 36.8 |
| | Mediterranean | 15.5 | 18.4 | 21.4 |
| | China | -50.1 | -12.1 | -13.8 |
| | N America West | 10.9 | 11.4 | 31.2 |
| | N America Other | 43.8 | 48.1 | 55.9 |
| | Latin America | -35.2 | -51.7 | -55.0 |
| Primary Aluminium | Offshore Europe | -103 | -433 | -631 |
| | NW Europe | 1229 | 1611 | 2046 |
| | Mediterranean | 1199 | 1676 | 1901 |
| | China | 994 | 56 | 209 |
| | N America West | -120 | 1046 | 861 |
| | N America East | 1165 | 1151 | 1240 |
| | Latin America | -1237 | -1280 | -1398 |
| Nickel | Offshore Europe | -166 | -174 | -183 |
| | NW Europe | 82 | 65 | 73 |
| | Mediterranean | 87 | 95 | 98 |
| | China | 102 | 168 | 320 |
| | N America West | 6 | -2 | -8 |
| | N America Other | -203 | -259 | -310 |
| | Latin America | 4 | 1 | -7 |
| Lead | Offshore Europe | 382 | 334 | 308 |
| | NW Europe | -333 | -104 | -171 |
| | China | -280 | -209 | -215 |
| | N America West | -54 | -107 | -112 |
| | N America Other | 215 | 202 | 233 |
| | Latin America | -12 | -27 | -2 |
| Copper | Offshore Europe | -575 | -688 | -558 |
| | NW Europe | 1055 | 802 | 856 |
| | Mediterranean | 1023 | 1192 | 1145 |
| | China | 1133 | 2081 | 2344 |
| | N America West | -1212 | -940 | -1294 |
| | N America Other | 2175 | 1910 | 1987 |
| | Latin America | -2757 | -3175 | -3858 |
| Zinc | Offshore Europe | -45 | -85 | -39 |
| | NW Europe | -132 | -263 | -197 |
| | China | -277 | 175 | -9 |
| | N America West | 30 | -14 | 20 |
| | N America Other | 308 | 193 | 246 |
| | Latin America | -64 | -76 | -24 |

Source: reproduced from CRU 2005

A2.15 Areas of net consumption are concentrated mainly in Europe, North America and China. South America is a net producer. The figure below shows the number of LME approved warehouse companies by geographical location.

Chart A2.1: Location of LME approved warehouse companies 2006



Note: given data limitations, it is assumed that there are four warehouse companies in Japan

Source: LME and Europe Economics

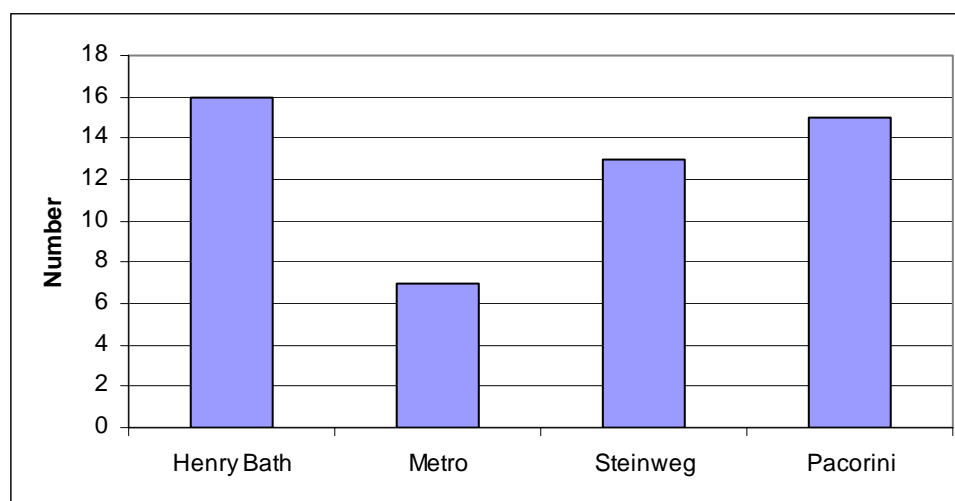
A2.16 While there is a good geographic spread of warehouses, some LME warehouses in particular locations have remained without metal for long periods and the original justification for them may no longer apply.

A2.17 The LME de-lists warehouses if they no longer meet its criteria for licensing and has recently taken a decision to de-list warehouses in Long Beach, Los Angeles (for copper) and Gothenburg.

Warehouse Companies

A2.18 There are a number of warehouse companies in the LME approved market. Many of these companies have warehouses in multiple locations and have significant non-LME business. Steinweg, Henry Bath, Pacorini and Metro are (in order of size) the companies with the most LME approved warehouses. Between them these four companies own over 200 warehouses (including multiple warehouses in individual locations) accounting for around 60 per cent of all LME warehouses. There is no indication that any one firm has a dominant position in the market in terms of ownership of warehouses.

Chart A2.2: Number of locations of LME approved warehouses by major companies



Source: LME and Europe Economics

A2.19 In addition to these four companies, there are a further 27 companies operating LME approved warehouses. Some, e.g. Owensboro Riverport Authority or Arrow Terminals operate in only one location.

A2.20 There is no indication that there are barriers to entry into the warehouse market beyond those of obtaining an LME licence. The LME's requirements which are additional to the requirements for non-LME warehousing have been noted above. Meeting these represents an additional cost but this does not appear to be disproportionate.

A2.21 However LME warrants are location (and indeed lot) specific. A withdrawer of metal holding a warrant for metal in his preferred location has little choice but to go to the warehouse specified on that warrant and request the withdrawal of the specified lot of metal. Although he could in principle swap the warrant for another at a different location, there is no incentive for other warehouses to offer lower exit charges because this would only lose them rent on metal withdrawn. The company taking metal from the warehouse therefore has little leverage or bargaining power over the warehouse and must in general pay the FOT charge demanded if he is to receive his metal.

Profitability and Competition

A2.22 Warehouse companies may offer ancillary services including freight, insurance, testing and packaging. Most warehouses not only provide these services but also operate warehouses for off-warrant metal and other commodities and for finished goods of various kinds. Warehouses are required by the LME to report on their businesses as a whole as evidence of their financial soundness but there is no requirement to account for LME business alone and it is therefore difficult to offer any reliable, detailed account of the profitability of an LME licence.

A2.23 However, discussion with stakeholders would support the idea that for LME warehouses across the cycle, profits are appropriate to the risks with which warehouses are faced. Circumstantial evidence appears to bear out this conclusion. Warehouses have been consolidating, and there are suggestions that some warehouses have been diversifying away from the cyclical LME business in order to reduce risk.

Diversity of Business Models

A2.24 Market players are more notable for their diversity than for their similarity. Warehouses differ in size, they may be members of a network of warehouses or stand alone, they may be an associate company in a large and diversified enterprise or a specialised undertaking, their business offering may be highly diversified or concentrated and their markets may be regional or global. One major warehouse company is owned by a trader.

Detailed list of Ownership and Locations of Warehouses

A2.25 The table below shows the location and ownership of LME approved warehouses globally.

St. Louis

Note the above does not include data on warehouse ownership in Japan, for which no data was forthcoming.

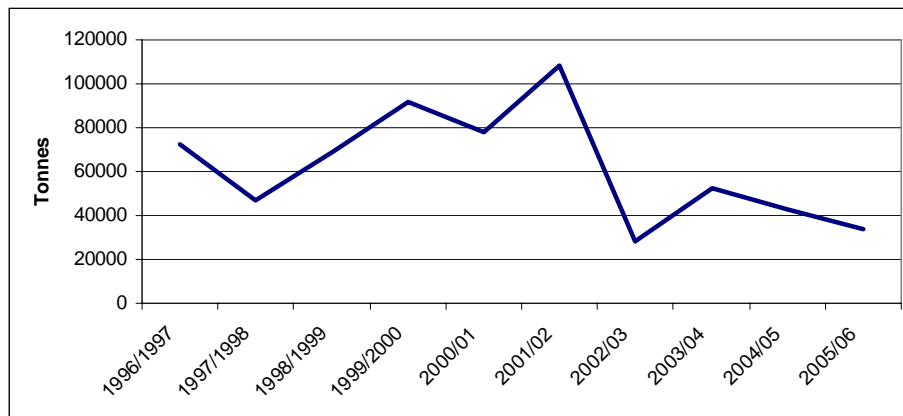
Metal Inflows and Outflows

A2.26 We now present some analysis of stock inflows and outflows into LME approved warehouses by metal.

Aluminium alloy

A2.27 The first chart depicts closing stocks in aluminium alloy in all LME warehouses. The stocks refer to metal on warrant only.

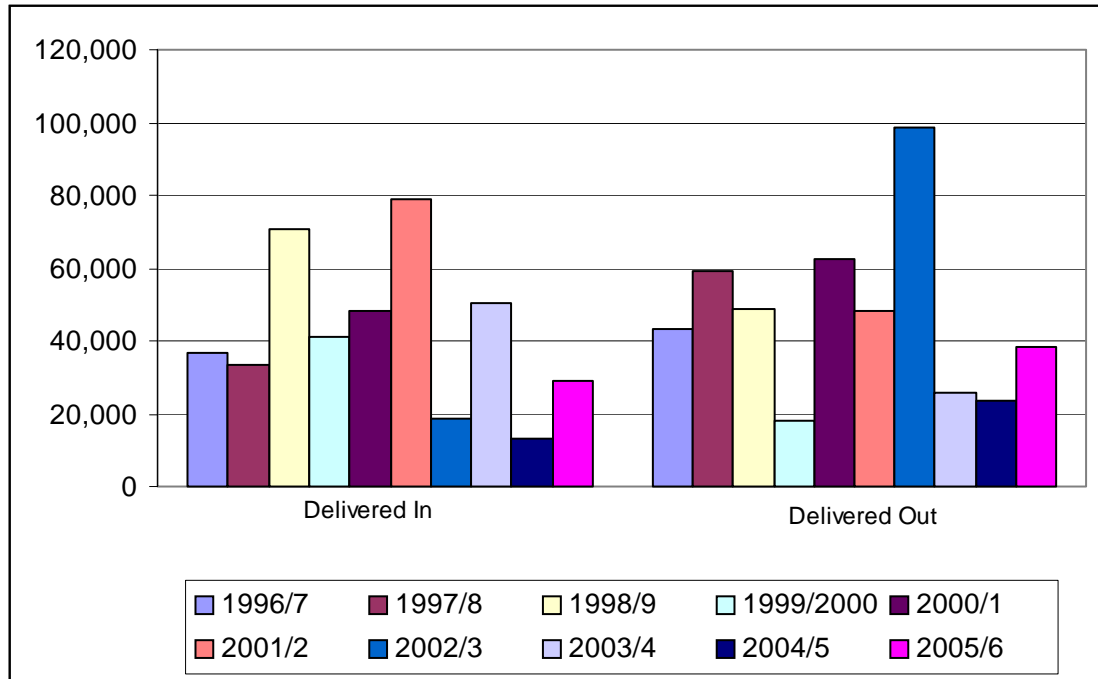
Chart A2.3: Closing Aluminium Alloy LME stocks



Source: LME and EE

A2.28 From a broad upward trend at the turn of the century, stocks in aluminium alloy have been declining since 2001/2. Although there was a recovery in 2003/4, the final closing stock recorded is far lower than at the start of the period; 33,500 tonnes compared to 72,400 tonnes. The associated inflows are shown below.

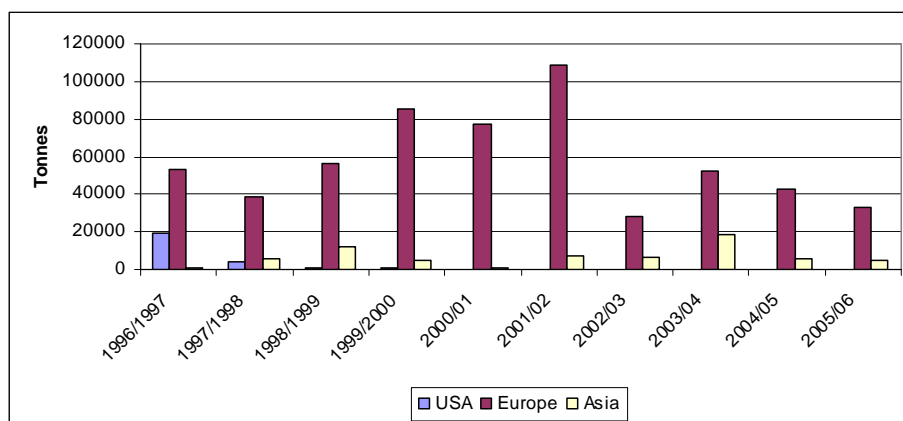
Chart A2.4: Aluminium Alloy LME stock inflows



Source: LME and EE

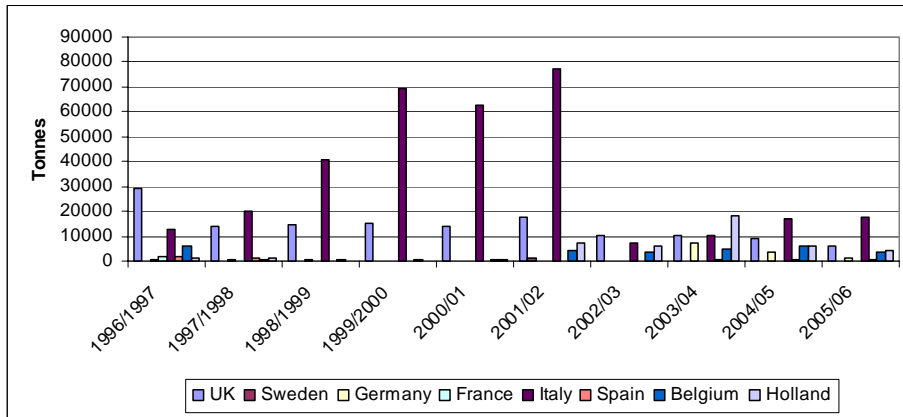
A2.29 The location of these stocks is not uniformly distributed. As the following graph shows, Europe houses by the far the greatest stocks of aluminium alloy. This is not surprising given that is an area of net consumption. By the end of the period there are no aluminium alloy stocks in the USA and Europe has nearly seven times the level of stocks as Asia. However, even within warehouses in Europe there is much variation in stock levels between warehouse locations.

Chart A2.5: Closing Aluminium Alloy stocks by region



Source: LME and EE

Chart A2.6: Closing Aluminium Alloy stocks within Europe



Source: LME and EE

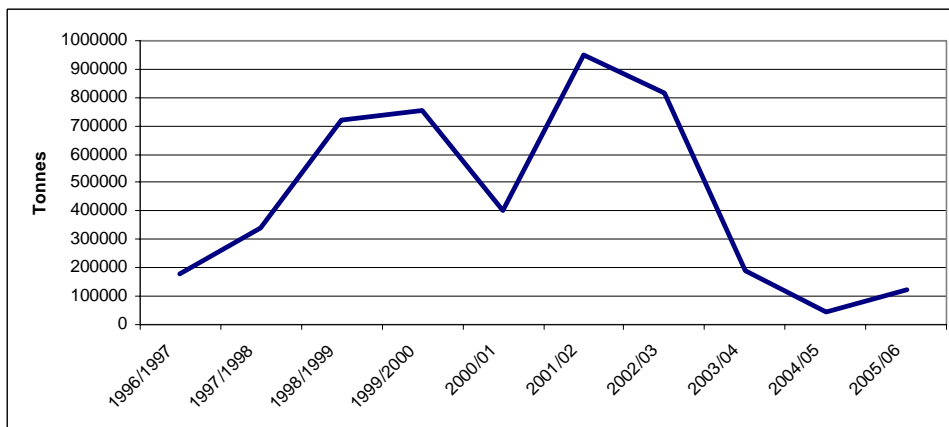
A2.30 Within Europe, until 2001/2, warehouses in the UK and Italy held the bulk of aluminium alloy stocks. By the end of the period, Italy still holds the most, but this is much reduced since the peak in 2001/2 (around 80 per cent of all European stocks). Further, other warehouse locations such as Holland and Belgium now hold comparable levels of stock.

A2.31 The total number of warehouse locations containing stocks has fallen from 18 in 1996/7 to 11 in 2005/6.

Copper

A2.32 The first chart depicts closing stocks in copper in all LME warehouses. The stocks refer to metal on warrant only.

Chart A2.7: Copper LME stocks

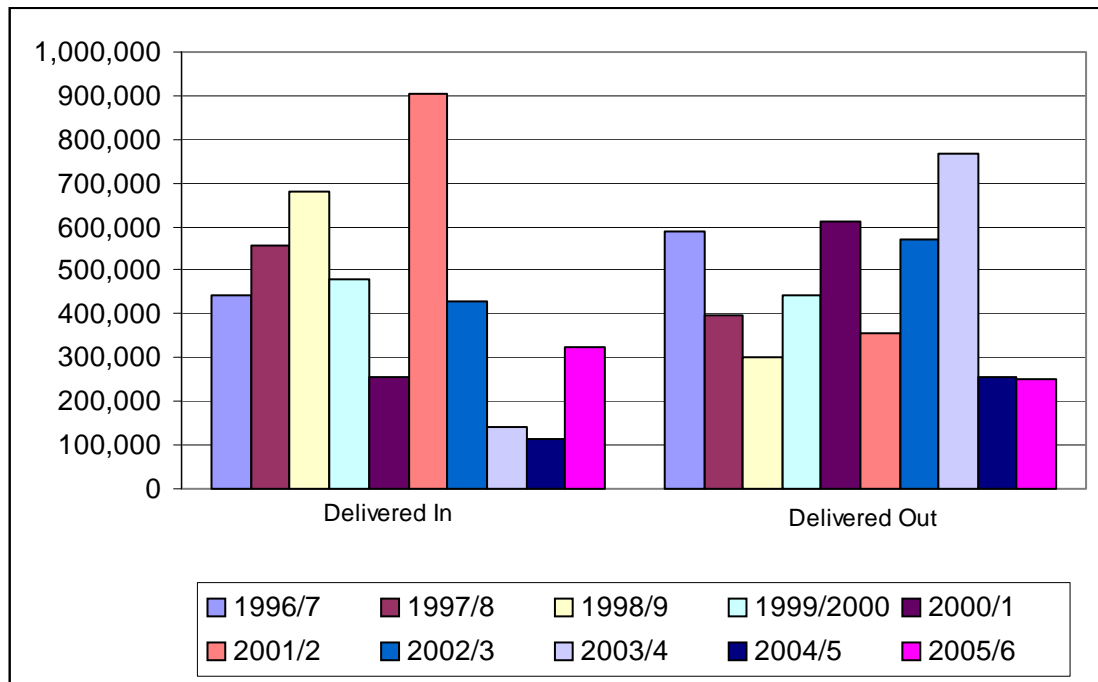


Source: LME and EE

A2.33 As the above graph shows starkly, copper stocks in LME approved warehouses have fallen dramatically since their peak in 2001/2. This reflects global pressure on copper in

recent years and the fact that we are currently in a period of deficit. The previous large inflows into LME warehouses have been sharply reversed, although the inflow was positive in 2005/6.

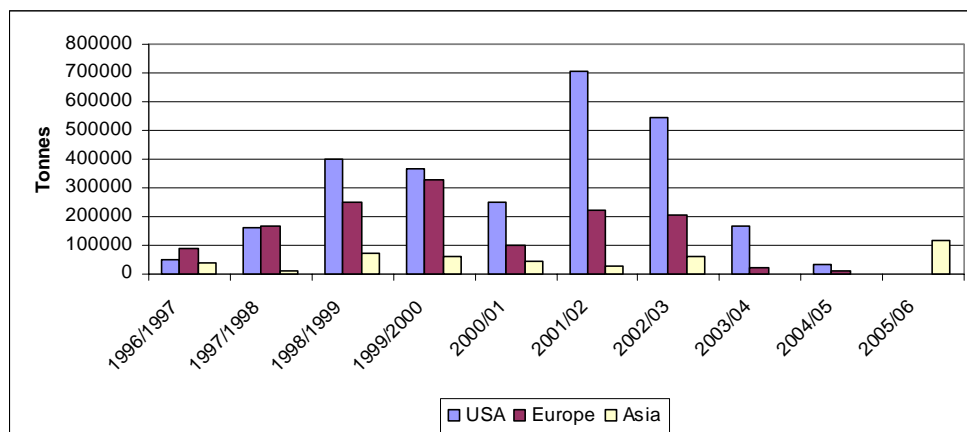
Chart A2.8: Copper LME stock inflows



Source: LME and EE

A2.34 However, what is particularly interesting is the location of copper stocks. As the bar chart below depicts, the copper outflows have mostly been sourced from LME approved warehouses in North America and Europe. At the end of the period there are only significant stocks left in Asia (largely in Korea) – 118,775 tonnes compared to 25 tonnes in Europe and 1,875 tonnes in North America.

Chart A2.9: Closing Copper stocks by region

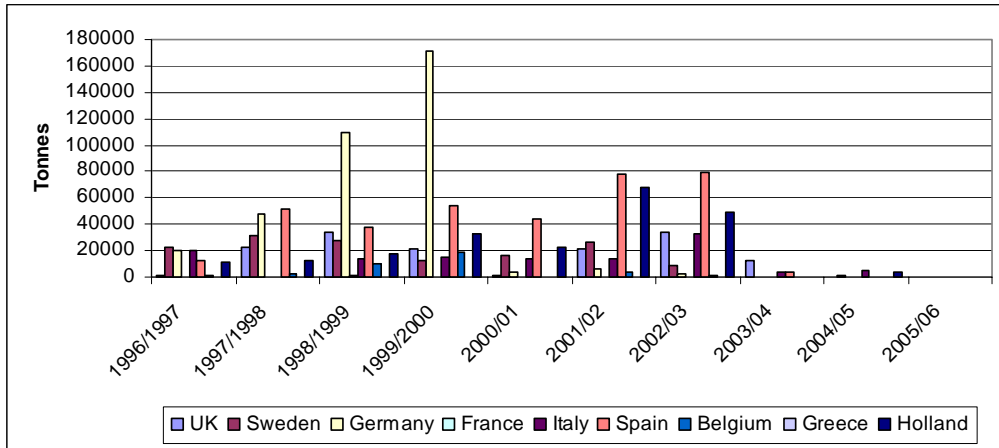


Appendix 2: LME Approved Warehouses

Source: LME and EE

A2.35 The large outflows from Europe can be seen on a country-by-country basis below, with Spanish warehouses holding Europe's only LME copper stocks.

Chart A2.10: Closing Copper stocks within Europe



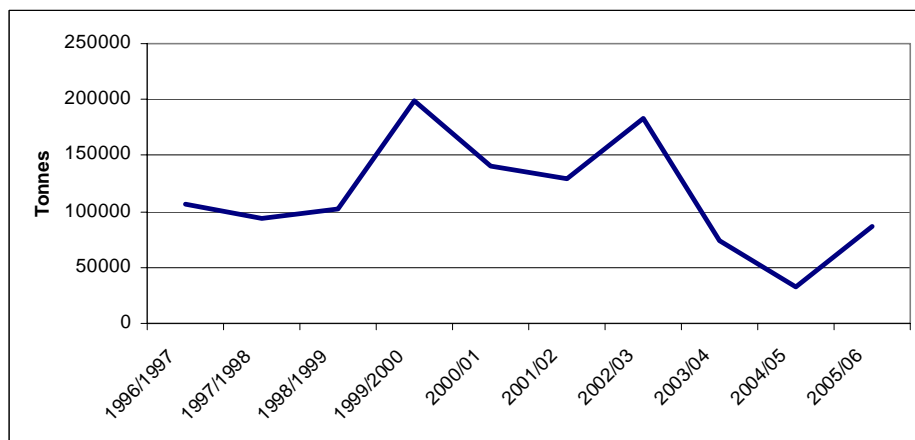
Source: LME and EE

A2.36 The decline in stock levels in Europe and North America has meant that the number of warehouse locations holding LME copper stocks globally has fallen from a peak of 22 in 2000/01 to just 7 in 2005/6.

Lead

A2.37 The first chart depicts closing stocks in lead in all LME warehouses. The stocks refer to metal on warrant only.

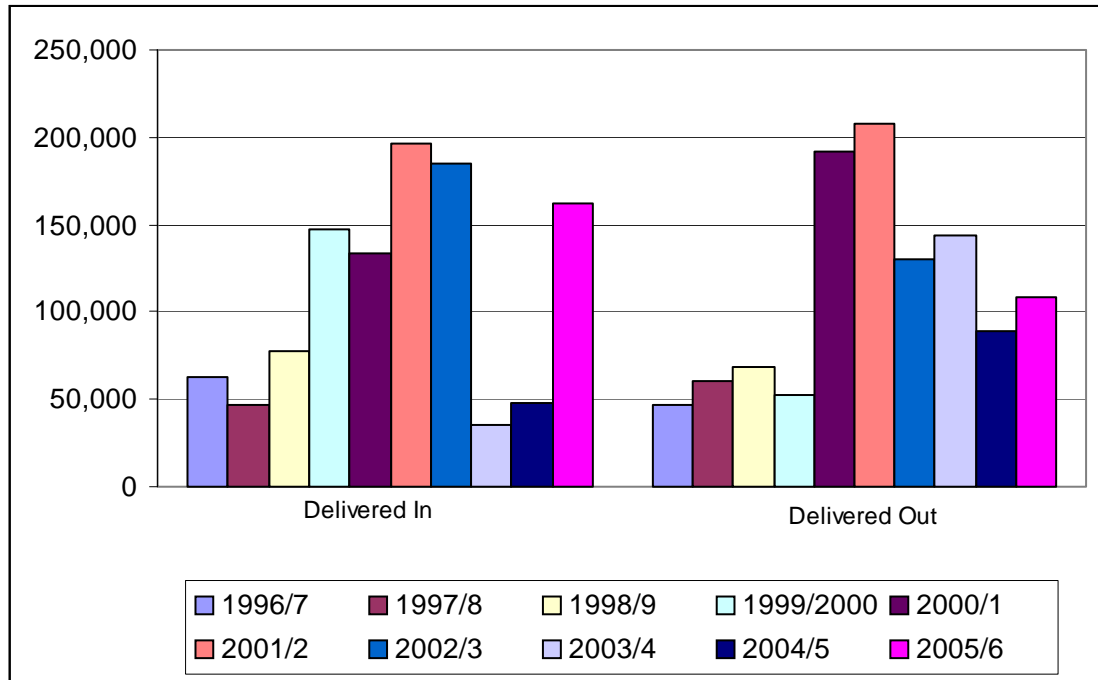
Chart A2.11: Lead LME stocks



Source: LME and EE

A2.38 Lead stocks in the last year have increased in LME approved warehouses. Lead inflows have become positive again after two years of outflows.

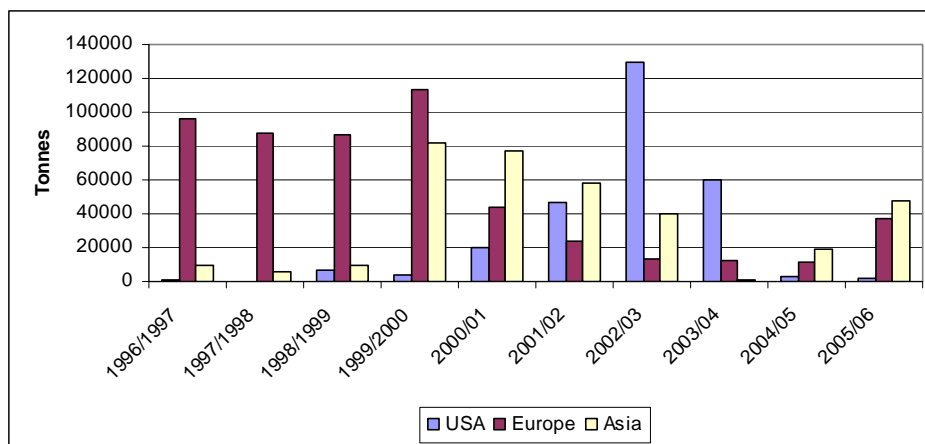
Chart A2.12: Lead LME stock inflows



Source: LME and EE

A2.39 However, these inflows mask an important trend in the LME lead warehousing market – the decline in American stocks. This can be seen below. From having had the highest stock levels in 2002/3, US warehouses have the lowest in 2005/6. As was the case with copper stocks, Asia now houses the most stocks of lead, although this time this is in Singaporean warehouses.

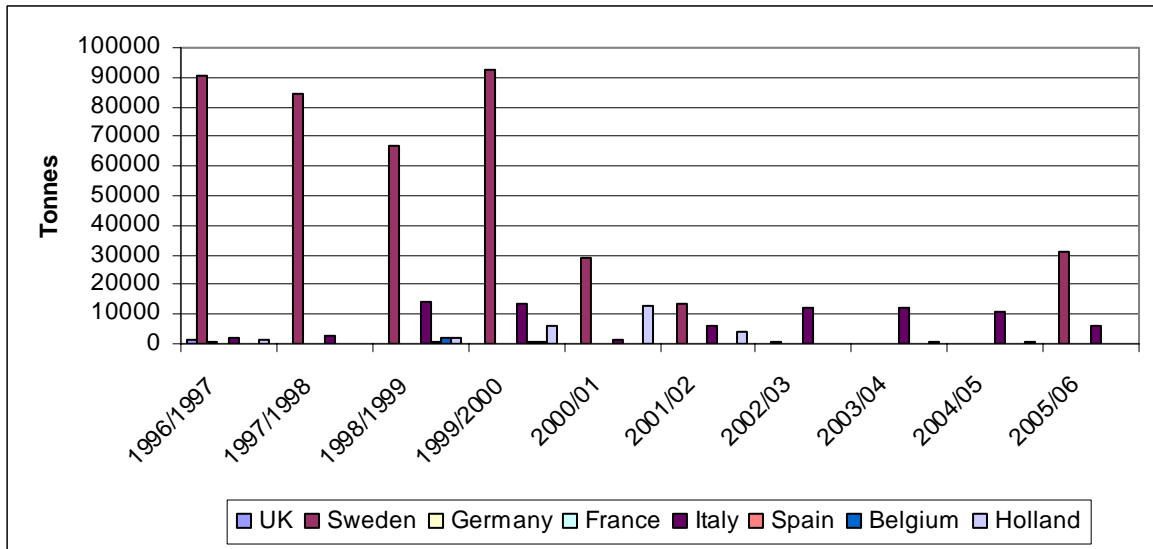
Chart A2.13: Closing Lead stocks by region



Source: LME and EE

A2.40 The decline in European stocks can be seen below on a country-by-country basis. LME lead can only be found in Sweden and Italy at the end of the period.

Chart A2.14: Closing Lead stocks within Europe



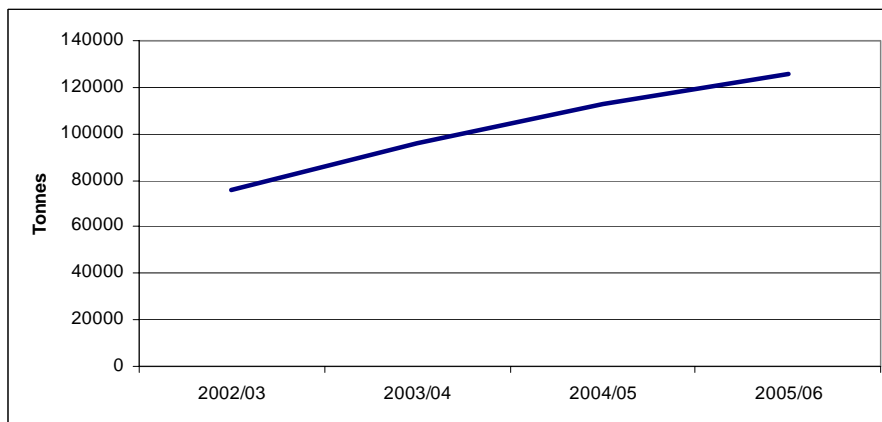
Source: LME and EE

A2.41 The number of warehouse locations holding stock has declined from 14 in 1996/7 to 7 in 2005/6.

NASAAC

A2.42 The first chart depicts closing stocks in NASAAC in all LME warehouses. The stocks refer to metal on warrant only.

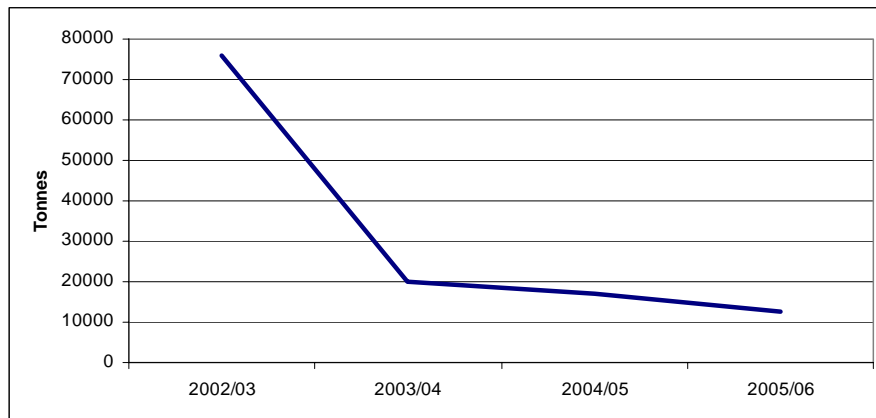
Chart A2.15: NASAAC LME stocks



Source: LME and EE

A2.43 Given that the dataset only begins in 2002/3 it is difficult to make any robust analysis of this metal market. In essence, the LME warehousing market for this metal is only four years old and trends seen so far may reflect start-up factors. It is unlikely, for example, that inflows into these warehouses will always be positive.

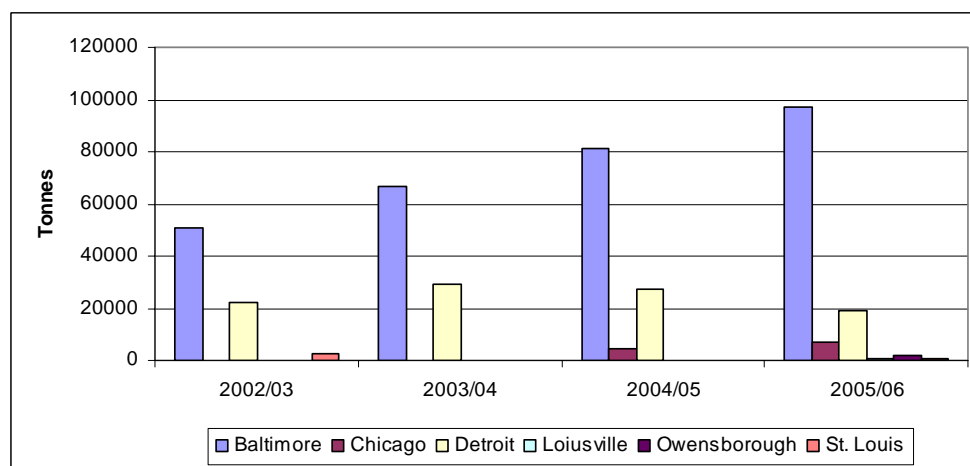
Chart A2.16: NASAAC LME stock inflows



Source: LME and EE

A2.44 Since 2002/3, the number of warehouse locations with NASAAC stocks has doubled from 3 to 6.

Chart A2.17: Closing NASAAC stocks by warehouse location

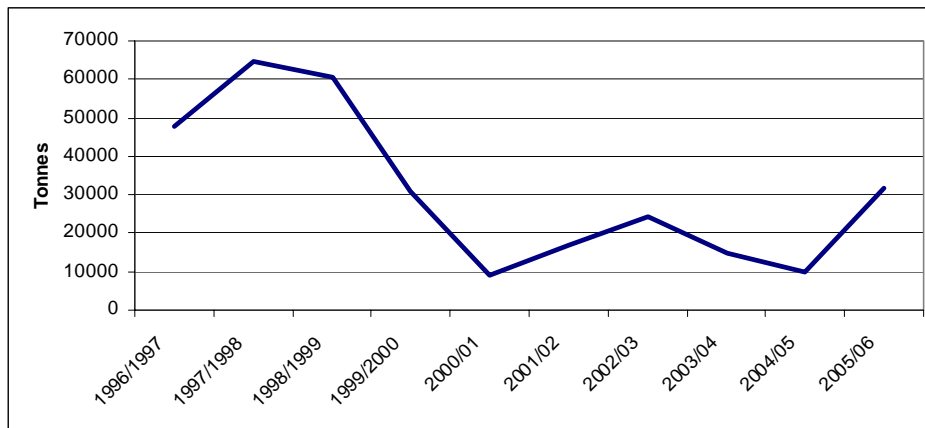


Source: LME and EE

Nickel

A2.45 The first chart depicts closing stocks in nickel in all LME warehouses. The stocks refer to metal on warrant only.

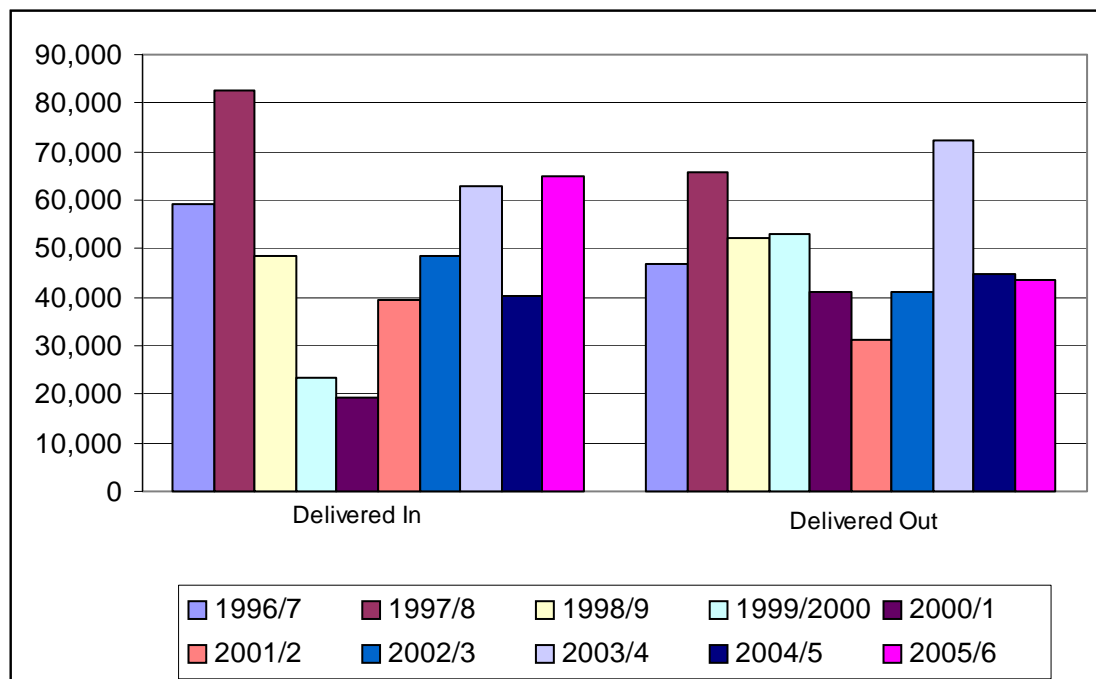
Chart A2.18: Nickel LME stocks



Source: LME and EE

A2.46 Like the other metals discussed already, nickel stocks in LME approved warehouses fluctuated a great deal through the period in question. Between 1998/9 and 2000/01 there was a sharp decline, with stocks reaching a low of 9,000 tonnes in 2000/01. Since then stock levels have recovered to 31,536 tonnes in 2005/6.

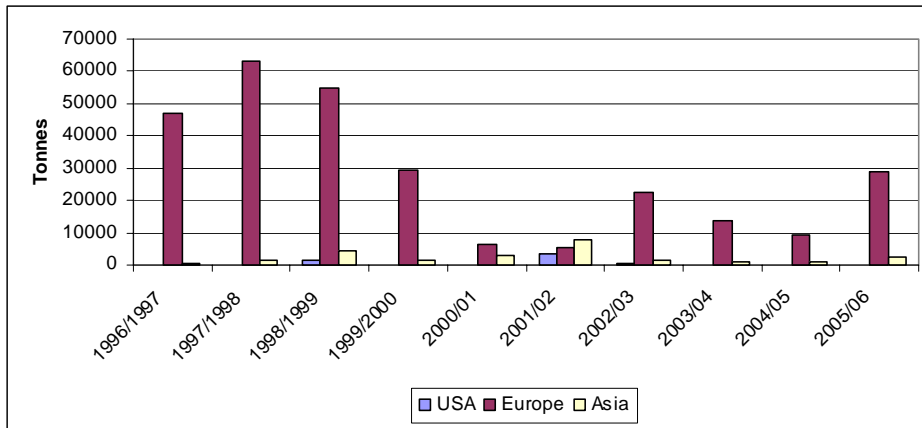
Chart A2.19: Nickel LME stock flows



Source: LME and EE

A2.47 Nickel stocks have been concentrated in Europe throughout the period in question. There have never been significant stocks in the USA, and Europe has around ten times the stock levels of Asia.

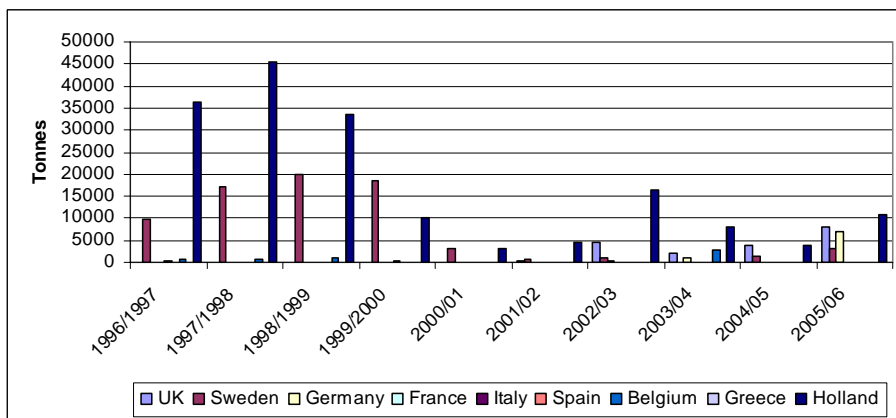
Chart A2.20: Closing Nickel stocks by region



Source: LME and EE

A2.48 However, the distribution of stocks within Europe has changed. At the beginning of the period stocks were concentrated in one location – Holland, with over 75 per cent of stocks. Gradually stocks have become more evenly distributed so by the end of the period, Sweden, the UK and Germany, along with Holland hold 10 per cent of European stocks each.

Chart A2.21: Closing Nickel stocks within Europe

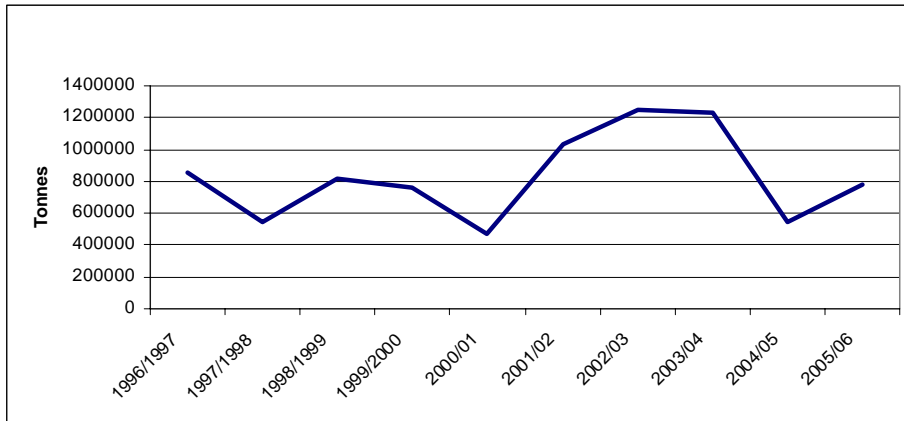


Source: LME and EE

Primary Aluminium

A2.49 The first chart depicts closing stocks in primary aluminium in all LME warehouses. The stocks refer to metal on warrant only.

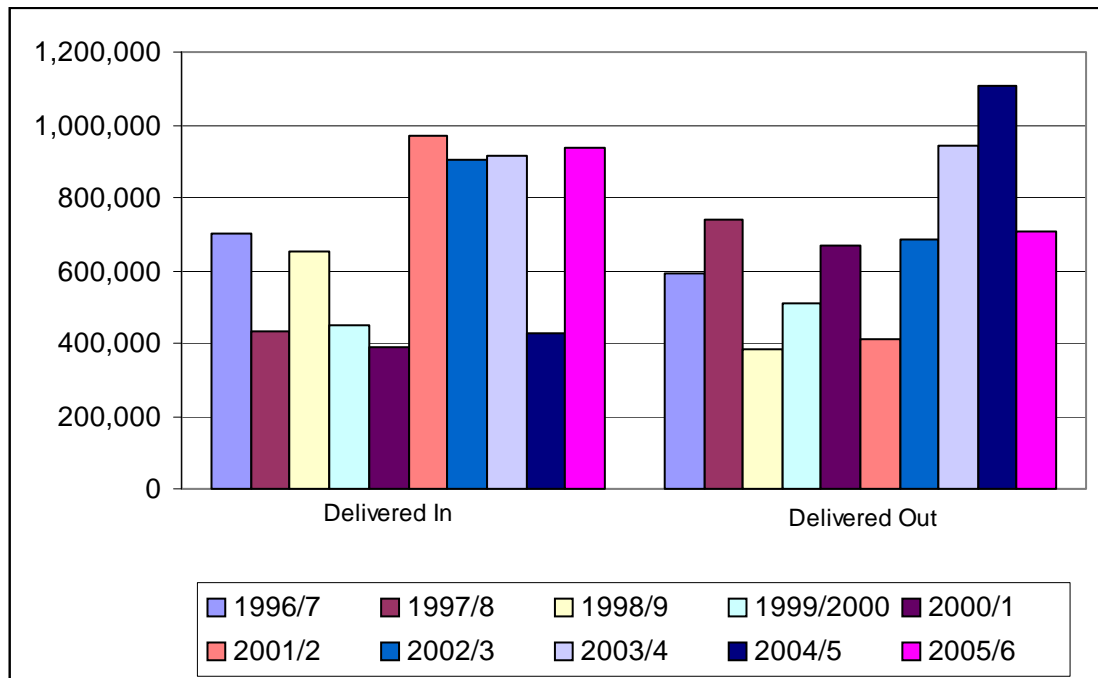
Chart A2.22: Primary Aluminium LME stocks



Source: LME and EE

A2.50 It is interesting to observe that unlike the other metals, primary aluminium levels in 2005/6 are quite comparable to those in 1996/7: 775,900 tonnes to 853,205. Inflows into LME approved warehouses have been more erratic than other metals, with few sustained periods of either outflows or inflows.

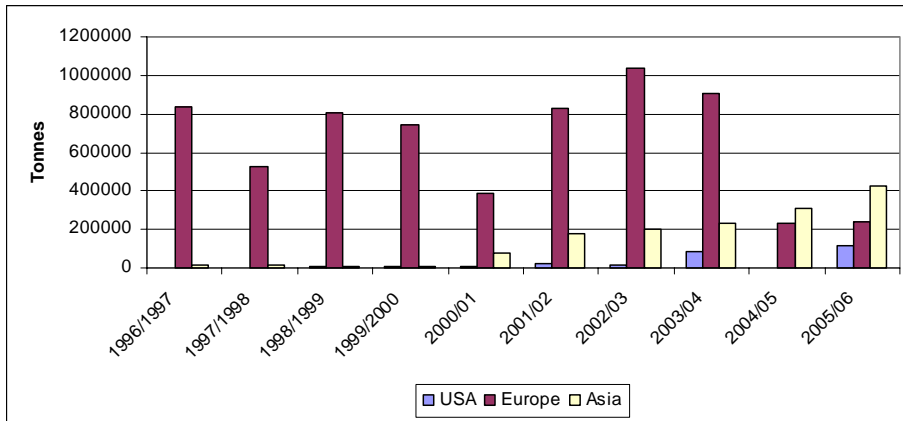
Chart A2.23: Primary Aluminium LME stock flows



Source: LME and EE

A2.51 Primary aluminium stocks have fallen in Europe and risen in other regions. Asia (Singapore) now has the largest primary aluminium stocks, and the US has been increasing in recent years also.

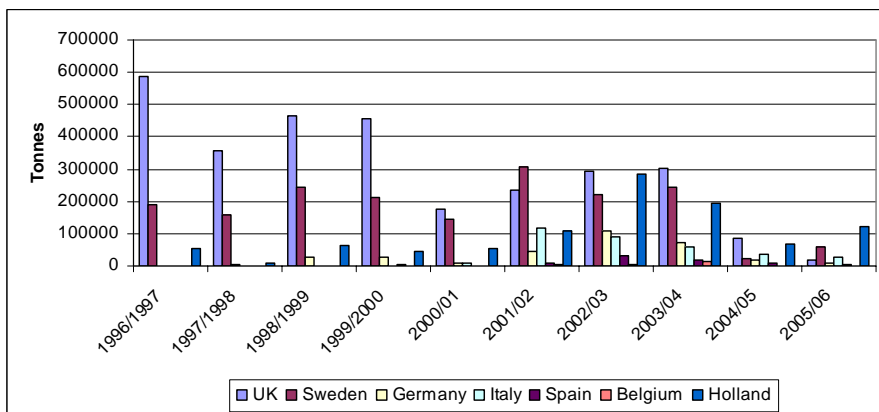
Chart A2.24: Closing Primary Aluminium stocks by region



Source: LME and EE

A2.52 Within Europe, the UK is no longer home to the largest LME primary aluminium stocks. In the early part of the period, the largest individual stocks of primary aluminium could be found in Liverpool. However, since 2000/01, other locations have increased their prominence, namely Holland and Italy. The UK now only has the third largest primary aluminium stocks in Europe, behind Italy and Holland.

Chart A2.25: Closing Primary Aluminium stocks within Europe



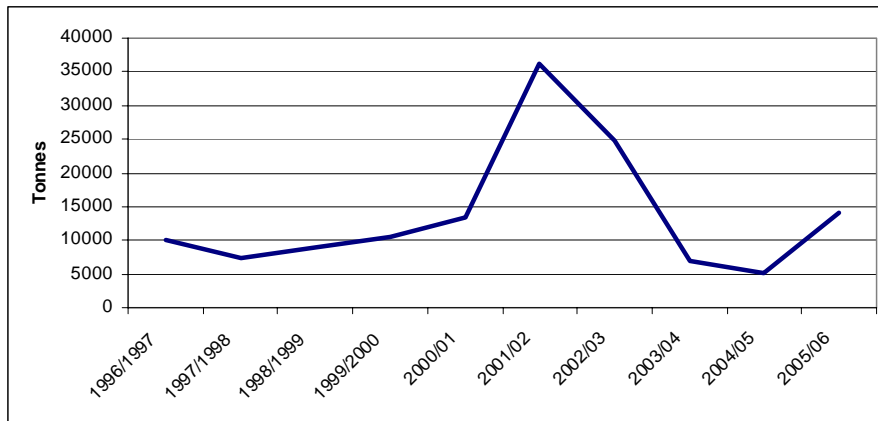
Source: LME and EE

A2.53 The number of warehouse locations with LME primary aluminium has remained relatively constant throughout the period in question from 17 in 1996/7 to 18 in 2005/6.

Tin

A2.54 The first chart depicts closing stocks in tin in all LME warehouses. The stocks refer to metal on warrant only.

Chart A2.26: Tin LME stocks

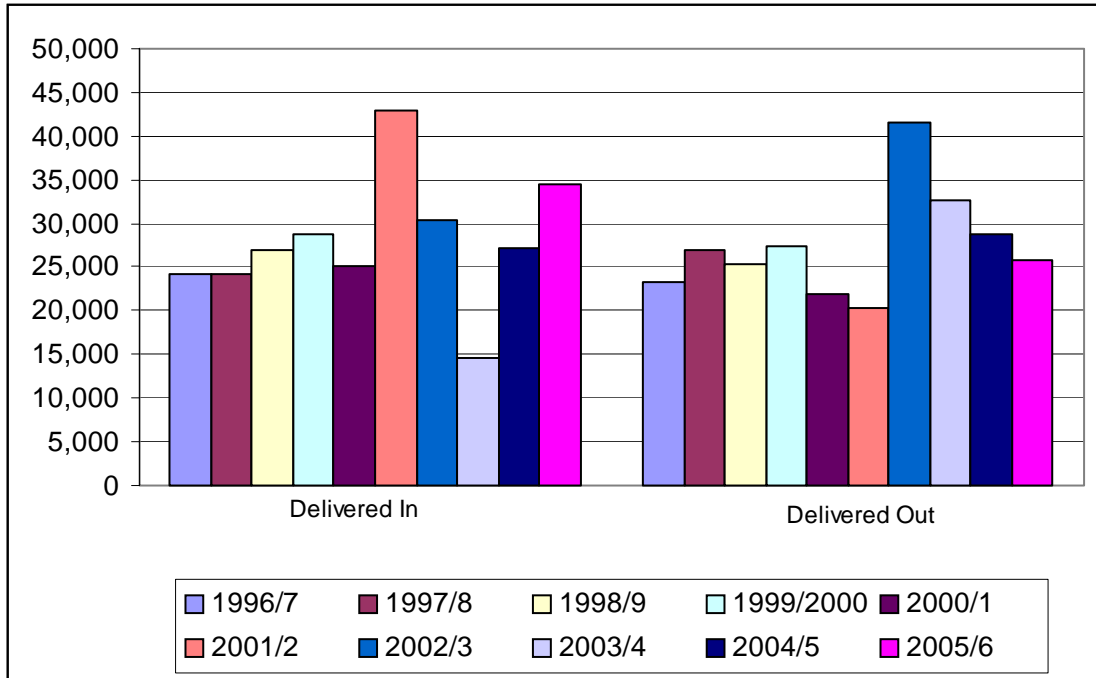


Source: LME and EE

A2.55 Following a period of relatively stable stock levels, LME tin stock levels spiked sharply in 2001/2 to 36,110 tonnes from 13,485 the previous year. Subsequently, there were tin outflows until 2005/6 when stock levels recovered to 1996/7 comparable levels.

A2.56 The large spikes in inflows and outflows are shown below.

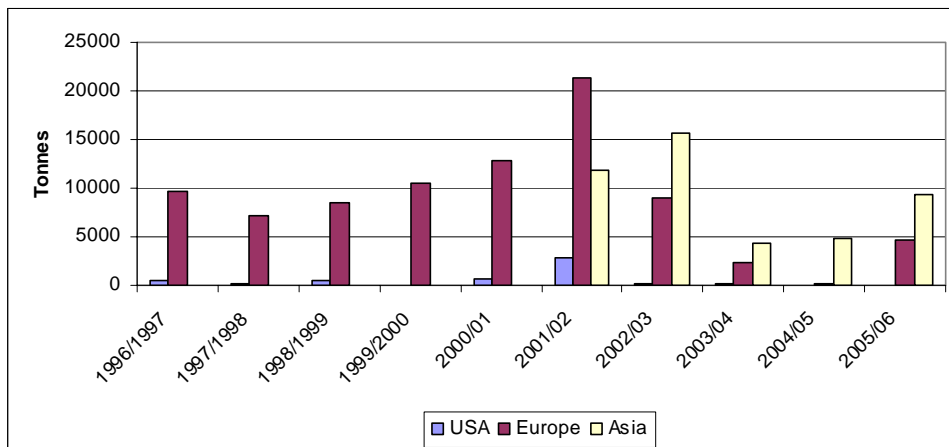
Chart A2.27: Tin LME stock flows



Source: LME and EE

A2.57 One can see that the large spike in tin stocks coincided with Asia becoming a much more important holder of tin stocks. After this date, European stock levels declined significantly, although they did recover in 2005/6. There are no LME tin stocks in American warehouses.

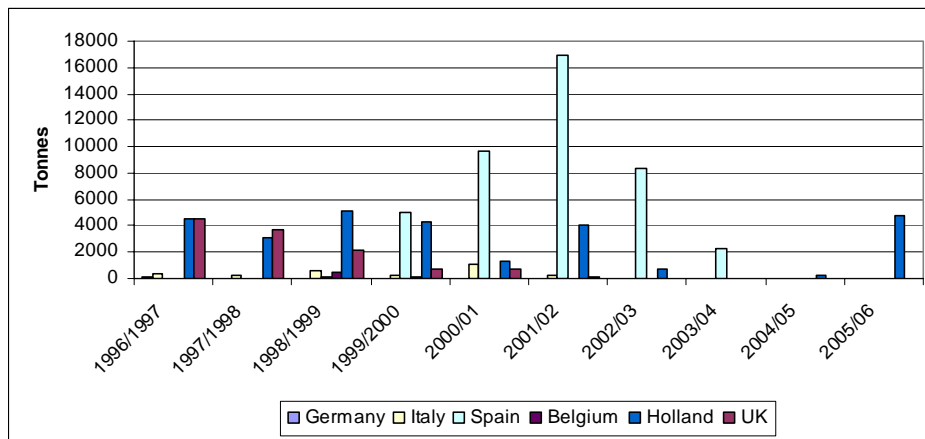
Chart A2.28: Closing Tin stocks by region



Source: LME and EE

A2.58 The graph below shows how European stocks which were originally split roughly evenly between the UK and Holland have changed dramatically. After 1999/2000, Spanish warehouses began to house large tin stocks in Europe, and by 2003/4 held over 95 per cent of total European LME tin stocks. However, just as dramatically, these stocks left Spanish warehouses the following year, and now all European tin stocks are held in Holland.

Chart A2.29: Closing Tin stocks within Europe



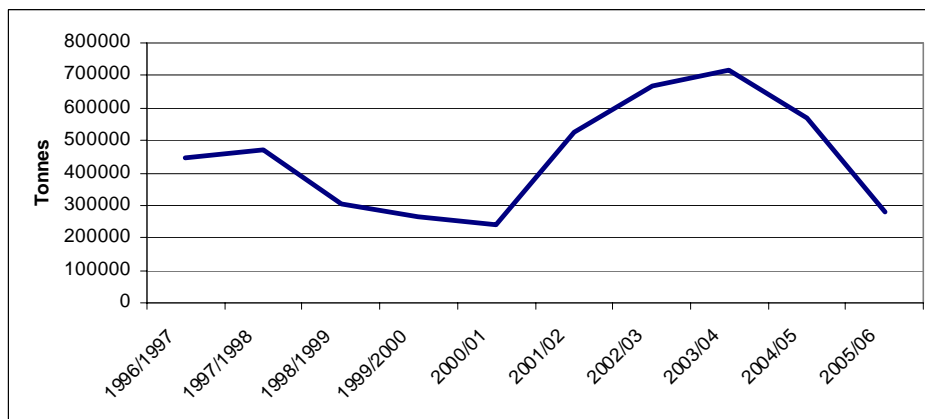
Source: LME and EE

A2.59 The number of total warehouse locations with LME tin stocks has fallen from 13 in 1996/7 to 5 in 2005/6.

Zinc

A2.60 The first chart depicts closing stocks in zinc in all LME warehouses. The stocks refer to metal on warrant only.

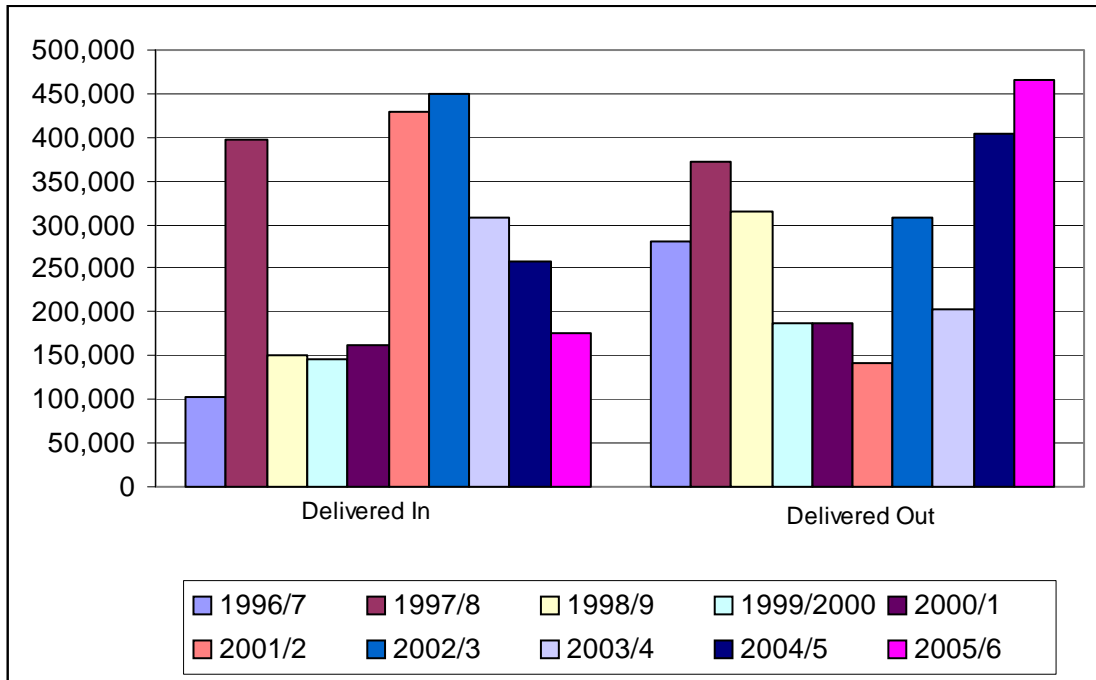
Chart A2.30: Zinc LME stocks



Source: LME and EE

A2.61 Since 2001/2 LME zinc stocks increased consistently to a peak in 2003/4 of 716,425. Subsequently, there have been large zinc outflows leaving zinc stock levels much lower than 1996/7 levels. This outflow of zinc is show graphically below.

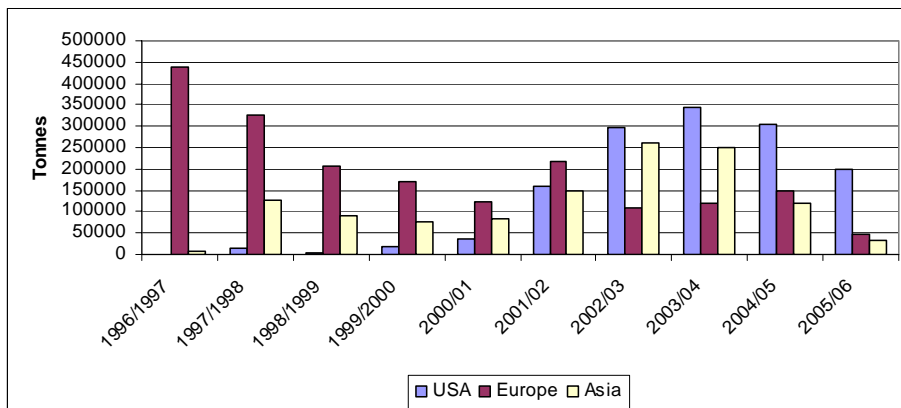
Chart A2.31: Zinc LME stock flows



Source: LME and EE

A2.62 The USA has the highest LME zinc stocks – apart from NASAAC this is the only metal where the majority of stocks can be found in North America. European stocks have declined, as have Asian stocks in latter years.

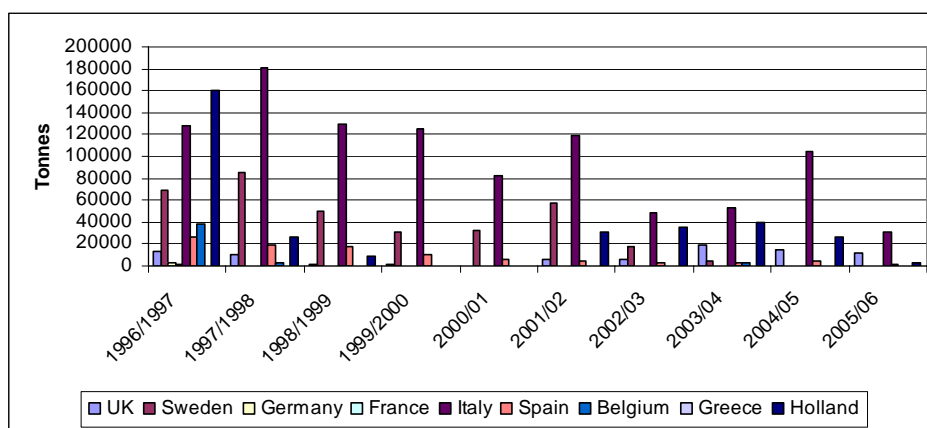
Chart A2.32: Closing Zinc stocks by region



Source: LME and EE

A2.63 The trends in European stocks are shown below. In this case, the largest stock levels can be found in Italy, and this has been the case throughout the period. The remaining European zinc stocks are mostly found in the UK.

Chart A2.33: Closing Zinc stocks within Europe



Source: LME and EE

Summing up

A2.64 From the discussion of metal inflows and outflows, one sees that there is no consistent picture between metals. However, there are some general trends that emerge (although of course there are exceptions). These are:

- (a) while historically, LME stocks of most metals have been largest in Europe, in recent years Asian stocks have accounted for a larger share of LME global stocks;
- (b) within Europe, there is much disparity between where stocks are located. However, there is a shift seen in some metals towards more stocks being located in Holland and Italy.
- (c) inflows and outflows into LME warehouse are variable and follow global demand conditions. Periods of sustained inflow are rare.

Warehouse FOT Revenues

A2.65 The importance of LME FOT charges, as a percentage of LME warehouse revenue, clearly varies across the cycle. This is not surprising as in periods of slack demand, more metal is likely to be in warehouses and will therefore be the source of more rental income, whereas in periods when stocks are being run down, the FOT will account for a larger proportion of revenues. The table below presents the ranges of the revenue from FOT suggested to us in discussion. The figures presented are merely indicative.

Table A2.4: FOT charges as a percentage of LME warehouse revenue (all metals) (%)

| | High demand for metal | Average demand for metal | Low demand for metal |
|-------------|-----------------------|--------------------------|----------------------|
| All regions | 25 – 75 | 15 – 45 | 9 – 30 |

Source: Europe Economics

A2.66 We also calculated the LME warehouse rent and FOT income using the annual LME stock data. Rent income is calculated by multiplying the average stock level (half the sum of opening stock and closing stock) by the average published maximum rent rate. FOT income is calculated by multiplying the metal outflow from LME warehouses by the average published maximum FOT rate.

A2.67 We have calculated two scenarios:

- (a) no discount: that warehouses offer no discount on either rent or FOT;
- (b) 50 per cent discount on rent only: that warehouses offer 50 per cent discount on rent but no discount on FOT.

A2.68 We have been informed from stakeholder consultation that warehouses rarely offer discount on FOT but frequently give discount on rents. Therefore the two scenarios could be read as the lower and upper bound of the FOT income as a percentage of LME warehouse income.

A2.69 The results are shown in the tables below.

Table A2.5: FOT charges as a percentage of LME warehouse revenue (primary aluminium)

| | No discount | 50% discount on rent only |
|----------------|-------------|---------------------------|
| 1998 | 14% | 24% |
| 1999 | 11% | 20% |
| 2000 | 22% | 35% |
| 2001 | 18% | 30% |
| 2002 | 12% | 21% |
| 2003 | 15% | 26% |
| 2004 | 23% | 37% |
| 2005 | 23% | 38% |
| 2006 (H1) | 13% | 23% |
| Overall | 17% | 29% |

Source: LME and Europe Economics calculation

Table A2.6: FOT charges as a percentage of LME warehouse revenue (copper)

| | No discount | 50% discount on rent only |
|----------------|-------------|---------------------------|
| 1998 | 17% | 28% |
| 1999 | 13% | 22% |
| 2000 | 23% | 37% |
| 2001 | 15% | 26% |
| 2002 | 15% | 26% |
| 2003 | 24% | 39% |
| 2004 | 36% | 53% |
| 2005 | 45% | 62% |
| 2006 (H1) | 31% | 47% |
| Overall | 21% | 35% |

Source: LME and Europe Economics calculation

Table A2.7: FOT charges as a percentage of LME warehouse revenue (lead)

| | No discount | 50% discount on rent only |
|----------------|-------------|---------------------------|
| 1998 | 15% | 26% |
| 1999 | 9% | 17% |
| 2000 | 23% | 37% |
| 2001 | 31% | 47% |
| 2002 | 28% | 44% |
| 2003 | 23% | 37% |
| 2004 | 32% | 49% |
| 2005 | 41% | 59% |
| 2006 (H1) | 19% | 32% |
| Overall | 24% | 39% |

Source: LME and Europe Economics calculation

Table A2.8: FOT charges as a percentage of LME warehouse revenue (nickel)

| | No discount | 50% discount on rent only |
|----------------|-------------|---------------------------|
| 1998 | 14% | 24% |
| 1999 | 16% | 28% |
| 2000 | 26% | 41% |
| 2001 | 26% | 41% |
| 2002 | 32% | 49% |
| 2003 | 44% | 61% |
| 2004 | 34% | 51% |
| 2005 | 25% | 39% |
| 2006 (H1) | 38% | 55% |
| Overall | 27% | 42% |

Source: LME and Europe Economics calculation

Table A2.9: FOT charges as a percentage of LME warehouse revenue (tin)

| | No discount | 50% discount on rent only |
|----------------|-------------|---------------------------|
| 1998 | 39% | 56% |
| 1999 | 45% | 62% |
| 2000 | 34% | 51% |
| 2001 | 17% | 30% |
| 2002 | 29% | 45% |
| 2003 | 32% | 48% |
| 2004 | 44% | 61% |
| 2005 | 32% | 49% |
| 2006 (H1) | 22% | 36% |
| Overall | 31% | 48% |

Source: LME and Europe Economics calculation

Table A2.10: FOT charges as a percentage of LME warehouse revenue (zinc)

| | No discount | 50% discount on rent only |
|----------------|-------------|---------------------------|
| 1998 | 19% | 32% |
| 1999 | 14% | 25% |
| 2000 | 18% | 31% |
| 2001 | 10% | 18% |
| 2002 | 15% | 26% |
| 2003 | 9% | 17% |
| 2004 | 16% | 27% |
| 2005 | 18% | 31% |
| 2006 (H1) | 22% | 36% |
| Overall | 15% | 27% |

Source: LME and Europe Economics calculation

Table A2.11: FOT charges as a percentage of LME warehouse revenue (all metals)

| | No discount | 50% discount on rent only |
|----------------|-------------|---------------------------|
| 1998 | 16% | 27% |
| 1999 | 12% | 22% |
| 2000 | 22% | 36% |
| 2001 | 17% | 29% |
| 2002 | 15% | 26% |
| 2003 | 17% | 29% |
| 2004 | 23% | 38% |
| 2005 | 24% | 38% |
| 2006 (H1) | 18% | 30% |
| Overall | 18% | 31% |

Source: LME and Europe Economics calculation

LME Warehouse Users and Incentives

- A2.70 Incentives (sometimes referred to as inducements) are very often paid by warehousing companies to attract metal to their warehouses. These incentives may take the form of cash payments or reductions in rents or other charges and other non-monetary benefits. In some cases, the concessions are tied to a “financing agreement” according to which the metal remains in the warehouse for a specified term, during which the warrant cannot be cancelled. Some stakeholders reported cases where warehouses had offered incentives to persuade a purchaser of warranted metal to withdraw from some warehouse other than their own (so prolonging the payment of rent). Incentives are not prohibited by the LME contract unless they are “excessive”, although that term “excessive” is not precisely defined.³⁰ However, the payment of incentives is not transparent and they do not appear as line items in company accounts.
- A2.71 There are conflicting views about the purpose of these incentives. One is that for most metal market participants and especially intermediaries, the decision where to deposit metal is the result of the examination of a range of possibilities, of which LME warehousing is just one. Under this hypothesis, a potential depositor of metal considers all his possible options and on the basis of an arithmetical calculation decides where to deposit metal. Expected incentives would necessarily play a part in this calculation. Thus higher incentives paid by warehouse operators might make the LME a more attractive location to deposit metals. On this view warehouses are competing for metal in competition with other users and arguably increasing the amount of metal in the system as a whole and in warehouses in particular.
- A2.72 Against this it was argued that it was wrong to see warehouses as participants in the market in the same way as their customers. The lots of metal held by warehouses are simply buffer stocks and are the residual of calculations made about supply and demand by the market as a whole. According to this argument the function of the warehouse is to serve as a deposit and supply source of last resort. Such a view implies that incentives are used by warehouse operators to compete against other warehouse operators for metal not with alternative sources of deposit; they are not used to attract metal into the LME system but rather to attract metal already destined for LME warehouses but not yet destined for a particular LME warehouse.
- A2.73 These two arguments are not necessarily mutually exclusive. It may well be the case that for some users of the LME system, the decision to use an LME warehouse as a source of supply really is a last resort, while for others the use of LME warehouses is a regular option chosen on the basis of arithmetic comparisons with other options.

³⁰ Clause 9.3.1 of the Terms and conditions applicable to all LME listed warehouse companies states: “The proper functioning of the market through the liquidity and elasticity of stocks of metal under Warrant should not be artificially or otherwise constrained by Warehouses giving exceptional inducements or imposing unreasonable charges for depositing or withdrawing metals, nor by Warehouses delaying unreasonably the receipt or despatch of metal, save where unavoidable due to force majeure.”

Appendix 2: LME Approved Warehouses

- A2.74 From our stakeholder discussions, it appears that for metal producers and metal fabricators the LME is, for the most part, the metal source of last resort.³¹ The conditions needed for LME warehouses to become the first choice for deposit (e.g. a period of sustained full contango) arise infrequently. On the other hand it appears from discussion that for traders/merchants/brokers the use of LME warehouses is a more regular event, and the majority of stakeholders agree that, although intermediaries constitute a minority of LME warehouse users in terms of number of firm, they account for the majority in/out flow of LME stocks through LME warehouses.
- A2.75 In general it was agreed that incentives were the outcome of negotiations between depositor and warehouse operator and differ by location as well as by customer.³²
- A2.76 A change of contract so as to include the FOT charge in the warrant would make the warehouseman's calculations about rents and incentives, already sometimes criticised as obscure, less transparent.
- A2.77 In discussion with stakeholders there were some references to the alleged inefficiency of warehouses and suggestions that warehouses were, on occasion deliberately slow in delivering metal out. It was observed that to reduce the FOT charge to zero at the time of delivery would remove one of the countervailing reasons against such reluctance to perform satisfactorily.

³¹ One fabricator complained that it was so difficult to extract metal from warehouses and it took so long to effect delivery that by the time the metal was available it was usually too late to meet a manufacturing commitment – not last resort but beyond hope, he claimed.

³² It was claimed by some stakeholders that certain LME warehouse locations would not be viable without incentives.

APPENDIX 3: THE FOT CHARGE

Background

- A3.1 The purpose of this appendix is to provide some empirical data about the value of the FOT charge by region and over time. It also attempts to test commonly made assertions about the relationship of the FOT charge to the LME price and to the physical premium.³³
- A3.2 When a holder of a metal warrant presents his warrant to the relevant warehouse, the warrant is cancelled and he is entitled to the associated lot of metal. Before this specific lot can be withdrawn two charges must be settled: any outstanding rental and the appropriate free-on-truck (FOT) charge.³⁴
- A3.3 Clause 5.1.4 of the Terms and Conditions of Warehousing Agreement states that the maximum rents and FOT rates must be fixed for a period of twelve months. The maximum rents and FOT rates that may be levied by warehouse operators are annually submitted to the LME. It is the practice for the LME to ask the individual warehouse companies for an explanation in justification of the amount the warehouse operator has notified if the amount notified appears to the LME to be excessive. These rates are then published and effective for the forthcoming year.
- A3.4 Whereas maximum rent rates differ between metals (perhaps due to their relative densities, i.e., floor space per tonne), maximum FOT rates do not. Both maximum rents and FOT rates differ between warehouses and regions.
- A3.5 The FOT charges have been described as the one guaranteed source of income for LME approved warehouses. Warehouses cannot be certain about the amount of rent they will receive because the length of the period that a lot of metal will be stored is uncertain. It was suggested in discussion that FOT charges might be negotiable by merchants who dealt regularly in large volumes and who operated at both ends of the warehouse – as depositors and withdrawers – but any such discount would be a reflection of the value of the overall business relationship.
- A3.6 This importance of FOT charge may be explained by the nature of the risks in the warehouse business. Metal on warrant can in principle be withdrawn at any time. Unlike non-LME metal which is typically subject to fixed term contracts with cancellation periods, there is no period of notice for LME metal. In the worst case for the warehouseman all the incentives paid to induce a deposit could be wasted if a depositor sold his warrant as soon as it was issued and the purchaser immediately withdrew the metal. As one

³³ This is discussed in the Report of Investigation into Complaints made to the London Metal Exchange about Practices of LME limited warehouses

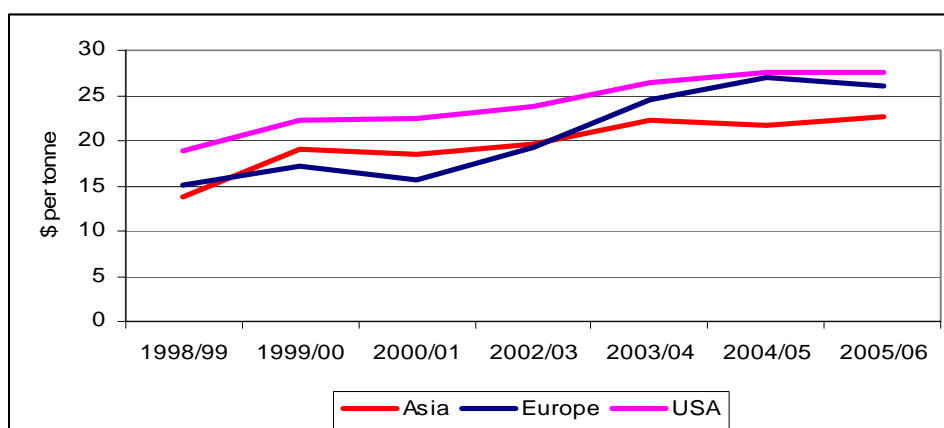
³⁴ There may be further ancillary charges, but these are not monitored by the LME.

stakeholder (not a warehouseman) observed, the FOT charge can be conceived as covering the risk of withdrawal without notice.³⁵

Trends in Maximum FOT Rates

A3.7 Published maximum FOT rates are shown by region in the chart below.

Chart A3.1 : Maximum FOT rates – all regions



Source: LME

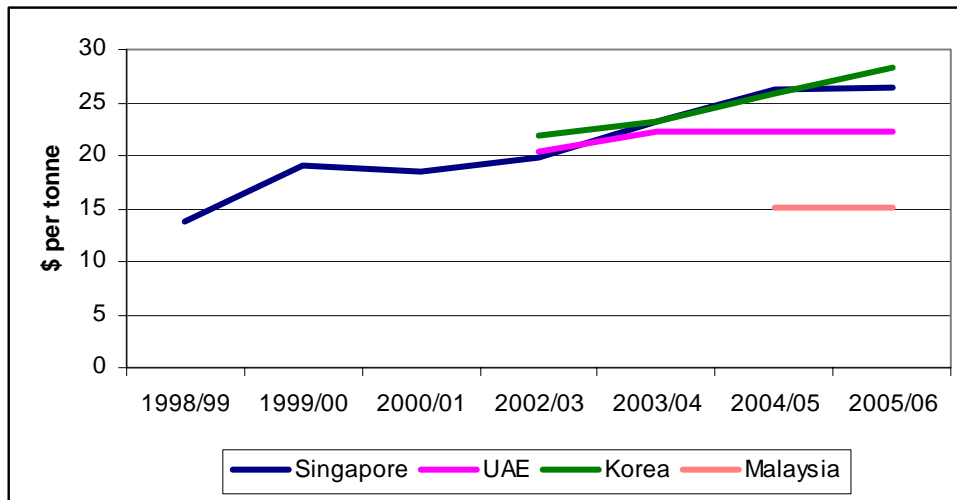
A3.8 It should be noted that the graph masks a number of differences within regions.

A3.9 As the figure below shows, the regional average maximum FOT rate in Asia is lower than in Europe and North America because of the low rates charged by Malaysian warehouses. If Malaysia is excluded from the average the maximum FOT rates are very similar.³⁶

³⁵ Using figures for 2006/7, the average rent for all metals is \$0.29 per day, which is equivalent to \$26.28 for three months, which is comparable to FOT rates.

³⁶ We have been informed that the next round of Malaysia FOT rates are much closer to that of Singapore and Korea.

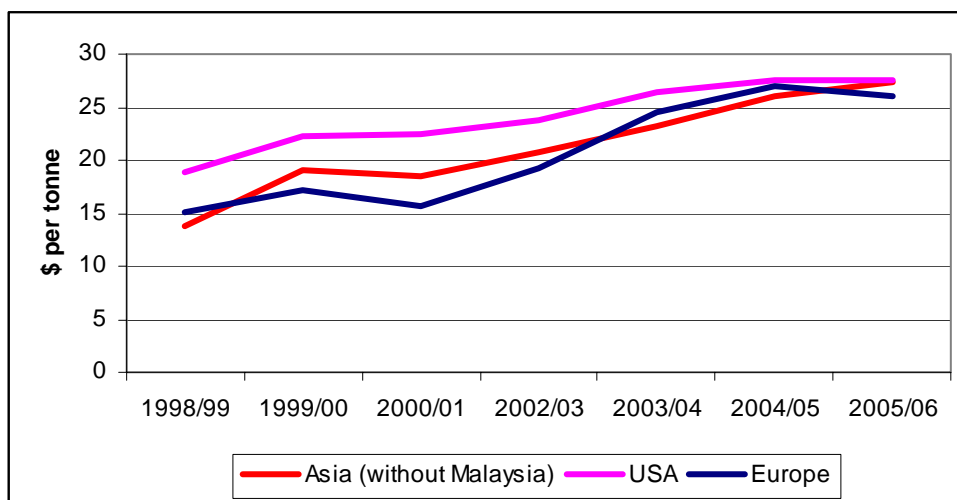
Chart A3.2: Maximum FOT rates in Asia



Source: LME

Note: Malaysia only started in 2004/2005

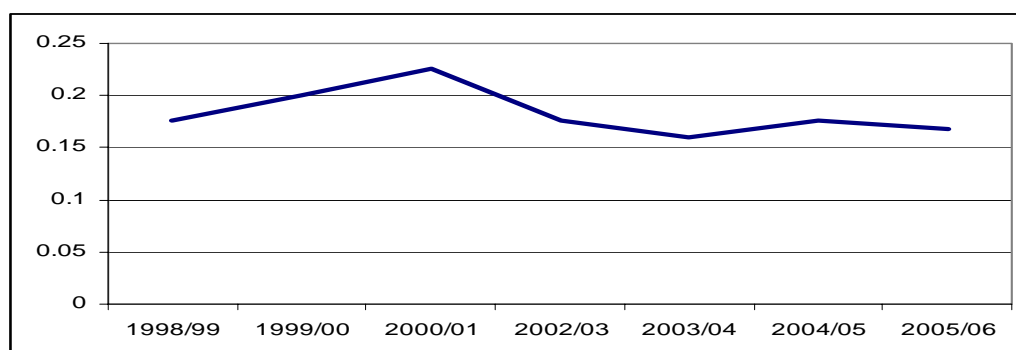
Chart A3.3: Maximum FOT rates by region (adjusted)



Source: LME

A3.10 The graph below shows the standard deviation between the maximum FOT rates (per tonne) by all warehouses as a proportion of average maximum FOT rates. It shows that the differences between maximum FOT rates, over the period, have not altered significantly.

Chart A3.4 : Divergence in Maximum FOT Rates of LME Approved Warehouse 1998-2006



Source: LME and Europe Economics analysis

The FOT and the Physical Premium

A3.11 The relationship between the FOT charge and the physical premium is a source of contention. Fabricators have argued that the FOT charge is accounted for in the physical premium as one of the opportunity costs incurred by a purchaser taking metal direct from a producer rather than a warehouse. It is further argued that producers therefore benefit unfairly from the FOT because while a fabricator may resort rarely to a warehouse the FOT charge appears in the physical premium on every tonne sold by a producer. Producers and other intermediaries observe that while it may be part of a salesman's rhetoric in justifying the premium, premia are in fact calculated as what the market can bear and that no conscious reference to the FOT charge is made.

A3.12 From a theoretical point of view it matters little whether such reference is conscious or not – it is difficult to see how, over any period of time or across a range of producers all trying to achieve the market clearing price, that price would not include an account of all the costs otherwise payable by a purchaser.

A3.13 Our statistical analysis suggests that there is such a relationship – although the statistical results have limited robustness.

Regression analysis

A3.14 Some basic regression analysis was carried out in order to test the hypothesis that the FOT is part of the producer premium. The initial equation to be estimated is a simple univariate (one explanatory variable) relationship of the following form³⁷:

$$PREMIUM_{i,t} = \alpha + \beta FOT_{i,t} + \mu_{i,t}$$

³⁷ The data was in panel data format (multiple time periods and multiple regions) so panel data techniques were used in the regression analysis.

A3.15 Where α is a constant which captures other physical premium components such as location premium, quality of metal etc, i refers to the region in question (Europe, Asia or North America) and t is the time period. The regression is carried out for copper, lead, nickel, tin and zinc using data from the LME and CRU.³⁸ The FOT rates have been converted into dollars at historic exchange rates.

A3.16 If the β coefficient for the FOT variable is found to be significant and positive, then it can be claimed that there is a correlation between FOT movements and premium movements. For example, as the maximum FOT rate changes upwards, so does the premium, and ergo the FOT is a component of the overall premium. The results are shown below:

Table A3.1: Regression results (dependent variable in premium)

| Metal | Constant | Coefficient on FOT | R square |
|---------|--------------------|--------------------|----------|
| Copper | 34.16 (0.00) | 1.25 (0.00) | 0.1289 |
| Lead | 81.51 (0.00) | -0.44 (0.04) | 0.0271 |
| Nickel* | -245.17 (0.278) | 23.88 (0.01) | 0.2801 |
| Tin | 293.23 (0.00) | -5.33 (0.14) | 0.1357 |
| Zinc | 16.62 (0.24) | 3.07 (0.00) | 0.4806 |

*Premium data are for melting nickel

Source: Europe Economics

A3.17 The number of observations for each regression ranges from 18 to 10. The low number of observations restricts the number of explanatory variables that can be used on the right hand side of the regressions, because the number of degrees of freedom is reduced. It also impacts upon the reliability of the analysis.

A3.18 Of the five regressions, it can be seen that in the cases of copper, lead, nickel and zinc, the LME approved FOT rate is a significant variable in the composition of the physical premium.

A3.19 Nonetheless, too much emphasis should not be placed on the exact value of the FOT rate coefficient as it is likely to be significantly biased upwards. This is because the

³⁸ It should be noted that the FOT data was significantly reconstructed to make its time period consistent with that of the premium data from CRU.

regression misses a number of explanatory variables, such as location, time, brand, etc.³⁹ This means the FOT rate coefficient will include these other effects – thereby becoming biased upward, and giving them more weight than is their due. This is especially evident in the case of nickel.

A3.20 For our purposes, the important result is that it is significant. However, the R^2 values are all less than 0.5 indicating a low “goodness of fit”. Although expected, this result is not conclusive. If more data were available (both for the dependent variable and for the explanatory variables) a more robust relationship might be demonstrated.⁴⁰

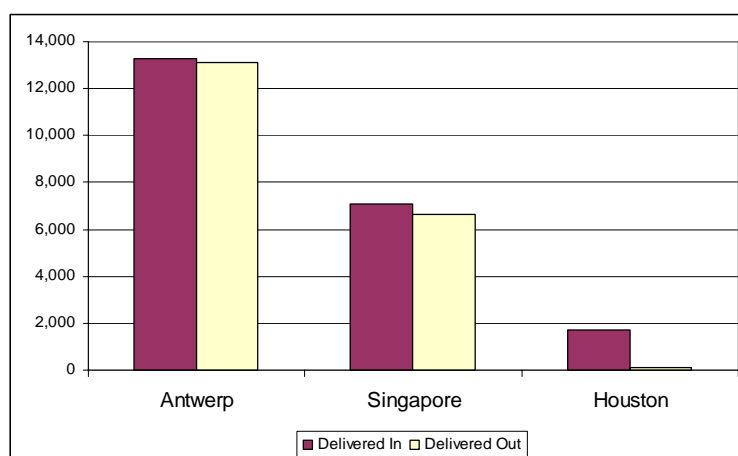
³⁹ A test for omitted variables (Ramsey RESET) does suggest the model is mis-specified. However, we do not have additional data to correct for this, or a longer time series.

⁴⁰ We cannot pool all the observations together from different metals because the premium data for one metal are not compatible with another.

APPENDIX 4: LME PLASTICS

- A4.1 The tables below set out delivered stocks of plastics in LME licensed warehouses. Given the novelty of the plastics contract, it is not surprising that the number of plastics warehouse locations is far smaller than that of metals: there are, at the time of writing, five warehouse locations for plastics.
- A4.2 The data presented in the following charts should be read very carefully and with caveats. Closing stocks are not always the difference between stock inflows and outflows (plus existing stocks) because plastic warrants have an expiry date. Thus, they will go off warrant after a finite period, and thus not appear on the out delivery statistics. Furthermore, there is rounding of plastic lot units (24.75 tonnes per lot) which may lead to some inaccuracies.
- A4.3 Nonetheless, the charts below give an indication of the new contract.

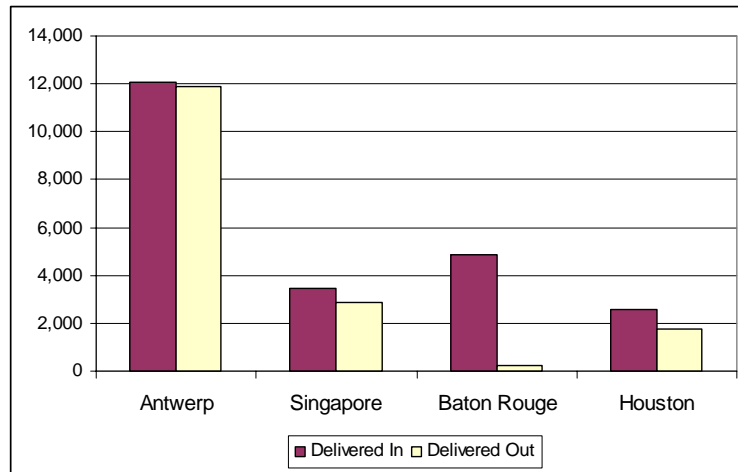
Chart A4.1: Delivered stocks of polypropylene (May 2005 – December 2006)



Source: LME

- A4.4 It should be noted that in addition to Antwerp, Singapore and Houston, there are LME licensed warehouses for polypropylene in Rotterdam and Baton Rouge (USA), but these have yet to be used.

Chart A4.2: Delivered stocks of linear low (May 2005 – December 2006)



Source: LME

A4.5 Again, it should be noted that in addition to Antwerp, Singapore, Baton Rouge and Houston, there are LME licensed warehouses for linear low in Rotterdam, but these have yet to be used.

APPENDIX 5: LIST OF ORGANISATIONS CONSULTED⁴¹

Alcoa Materials Management

Ambrian Commodities Limited

BE Wedge Holdings Ltd

C Steinweg-Handelsveem BV

Chile Copper Ltd

Gesamtverband der Deutschen Buntmetallindustrie e.V.

Henry Bath and Son

Hydro Aluminium

International Commodity Services Limited

International Wrought Copper Council

KM Europa Metal

Koch Metals Trading Ltd

LIFFE

Metro International Trade Services LLC

Mitsubishi Corporation (UK) Plc

NEMS Ltd

Norddeutsche Affinerie AG Recycling

RJH Trading Ltd

Salzburger Aluminium AG

Sempra Metals Ltd

Stratton Metalsk

⁴¹ Please note that we have had meetings more than once with some organisations.

Appendix 5: List of Organisations Consulted

Transamine SA

Umicore

Wildshaw Limited

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LME memorandums

Warehouse company re-delivery charges, 28 July 1998

LME warehouse companies' FOT charges, 19 June 1998

LME warehouse companies' FOT charges, 23 June 1998

Amended LME policy and guidelines regarding the approval of good delivery points, 24 November 2003

Amended LME policy regarding the approval of warehouses, 24 November 2003

Other documents

SWORD Operating Procedures

SWORD Regulations

LME Warehouse Agreement (Plastics and Metals)

Terms and conditions applicable to all LME listed warehouse companies

Schedule A of application to become an LME warehouse (Plastics and Metals)

LME Enforcement and Disciplinary Procedures applicable to all LME Warehouses (Plastics and Metals)

LME Holdings Consolidated Financial Statements 2001-2005

LME Contract Specifications