Weather Risk Management

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- Index Based Weather Covers

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- Energy

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Concept of index based weather covers: Definitions

- Traditional insurance :
  - Material damage and loss of profit following an exceptional event such as storm, typhoon, flood…
  - Covered by "usual insurance" products with an indemnification of incurred and adjusted losses
- Index based cover :
  - Risk exposure is based on the strong correlation between company's sales/income/expenses and daily meteorological variations.
  - Payout is agreed and triggered only by a weather index, assuming the index is a good proxy to the exposure.

Concept of index based weather covers: Multiple choice of indices

- **Underlying:**
  - Temperature
  - Precipitation : rainfall, snowfall
  - Others : wind speed, relative humidity...
  - Combinations
- **Index:**
  - Critical day
  - Mean (weighted or not)
  - Cumulative (with threshold or not)
  - Combinations

Concept of index based weather covers: Key elements of the product

- **A cover is defined by :**
  - A period (November to March)
  - An index (cumulated rainfall, HDD, Mean Temp...)
  - A weather station (Paris Orly)
  - A payment structure (Put, Call, Swap, etc)
  - A legal agreement (insurance or derivative)
- **The hedge is tailor made :**
  - Index is best proxy to the correlation between the risk exposure and the weather conditions

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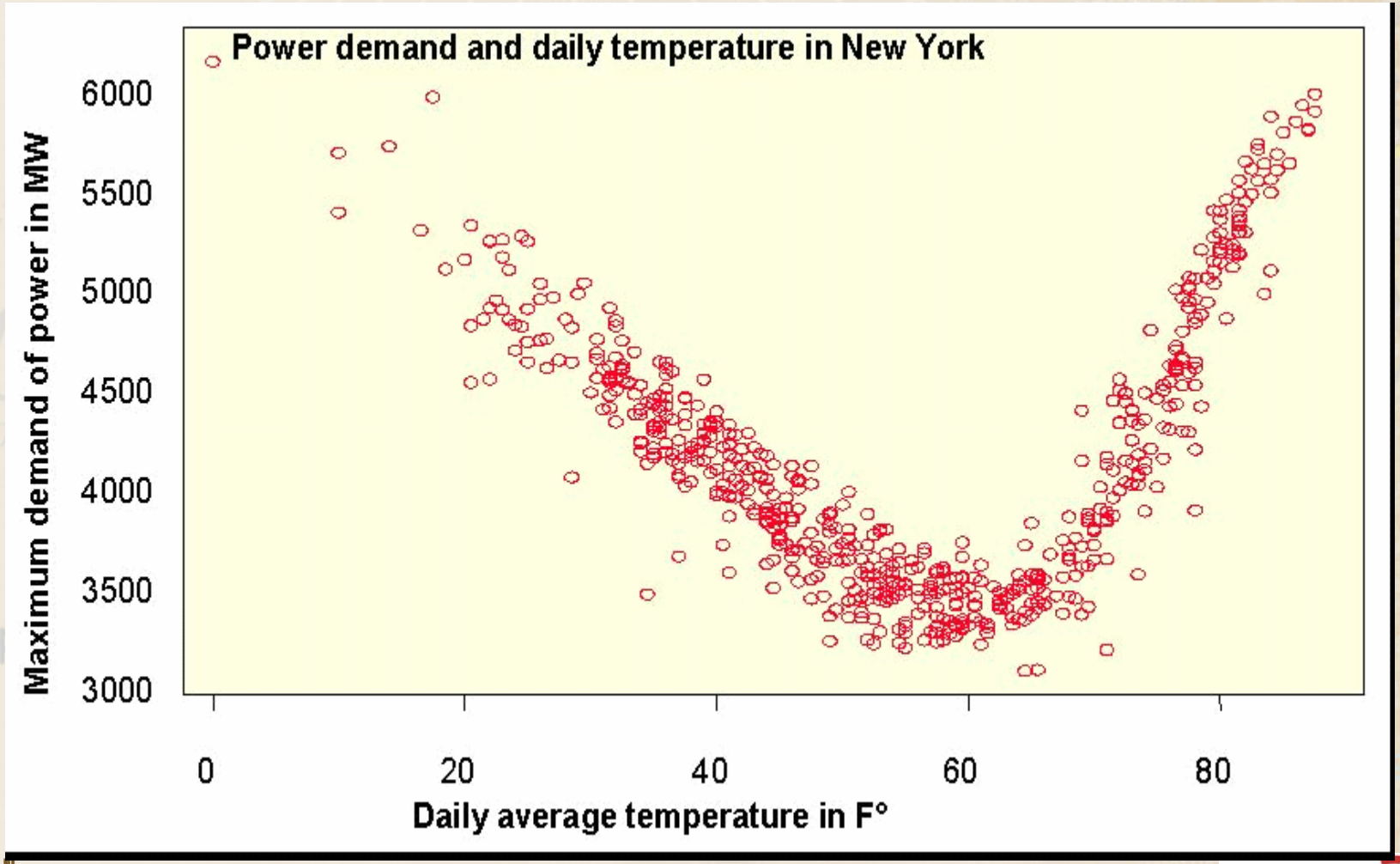
Energy sector example: Heating demand fluctuates in winter (1/2)



Energy sector example: Heating demand fluctuates in winter (2/2)

- **Weather risk exposures** :
  - Sales decrease when winter is too mild (heating demand)
  - Profitability decreases when winter is too cold (costs)
- **Solution :**
  - HDD Put against mild winter and a decrease in sales
  - HDD or CTD Call, against a too cold winter and increase in costs

HDD, Heating Degree Day : Number of degrees below 18°C
CTD, Critical Temperature Day : Number of days where temperature < 0°C

Energy sector example: Wind farm financing secured by wind guarantee

- **Weather risk exposure :**
  - Sales are secured and prices are regulated
  - Wind speed is the key factor: power generation is linked to wind speed through the power curve

- **Solution :**
  - Index: WPI: Wind Power Index
  - Put : protection against lack of wind ie drop in power generation
  - Financial leverage to decrease the cost of capital
  - Guaranteed minimum income is a security for creditors

Insurance or energy example: Marketing Smoothing your Heating/Air conditioning bill

- **Weather risk exposures :**
  - When summer is too hot (or the winter is too cold) end user electricity bill increase (Air conditioning/Heating demand)
- **Solution :**
  - Monthly or seasonal digital protection against a high average daily maximum temperature. (ex $100 if Av. TMax > 30°C)
  - Client pay off: credit on the next bill
  - Guarantee paid by the client or free and provided by the distributor
  - Development of customer loyalty and marketing differentiation

Index Based Reinsurance: Wind trigger and intensity of damages

- **Weather risk exposure:**
  - Property and motor physical damages due to strong storms are strongly correlated to the wind speed
- **Solution:**
  - Annual aggregate excess of loss property treaty
  - 10 weather stations spread all over France
  - Each station has a specific weight
  - Each station has a specific wind speed threshold high enough to capture only strong storms (e.g. 120 Km/h)
  - Each station has a specific wind speed limit high enough from the threshold (e.g. 160 km/h) as to capture storms severity

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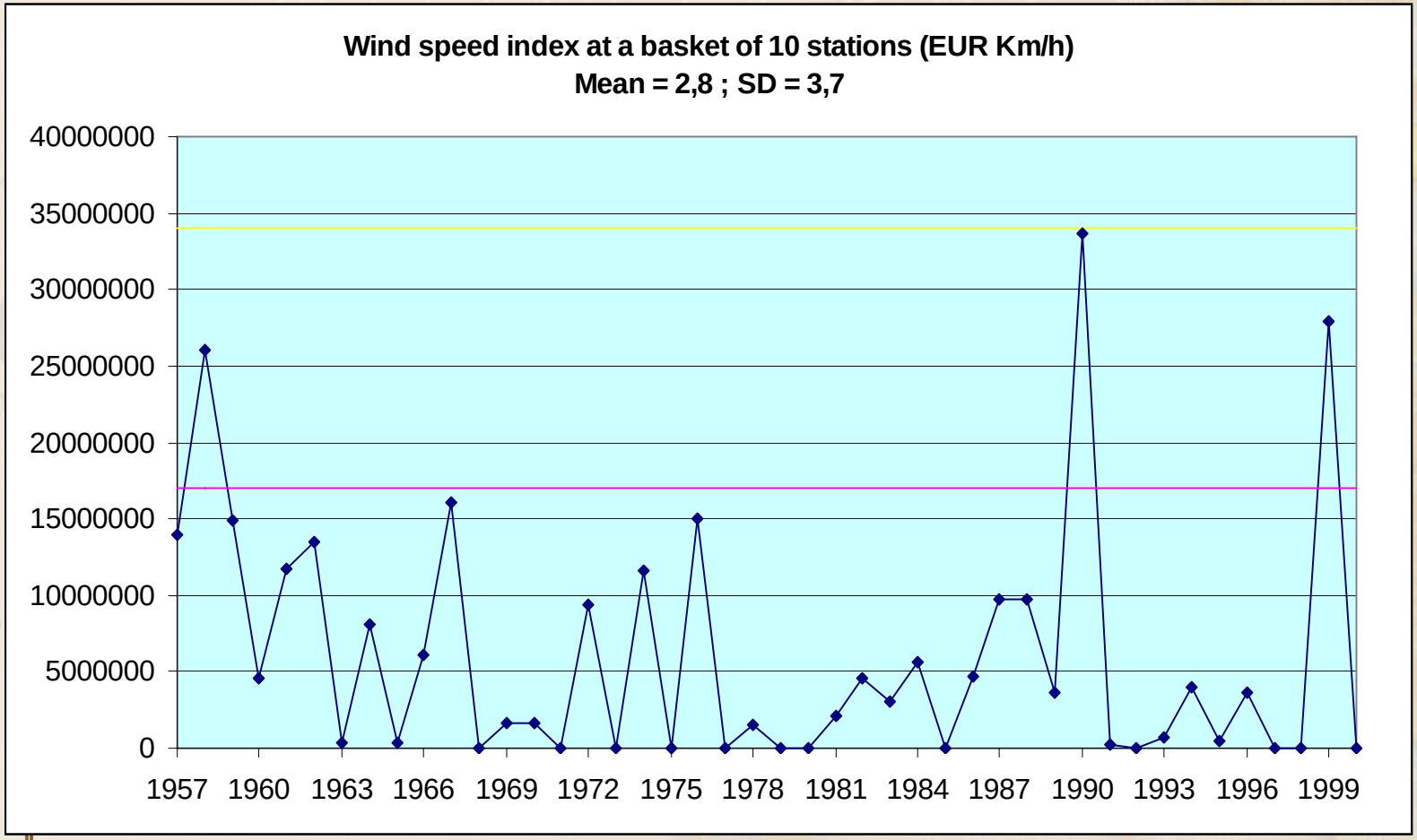
Index Based Reinsurance example: Wind trigger and intensity of damages



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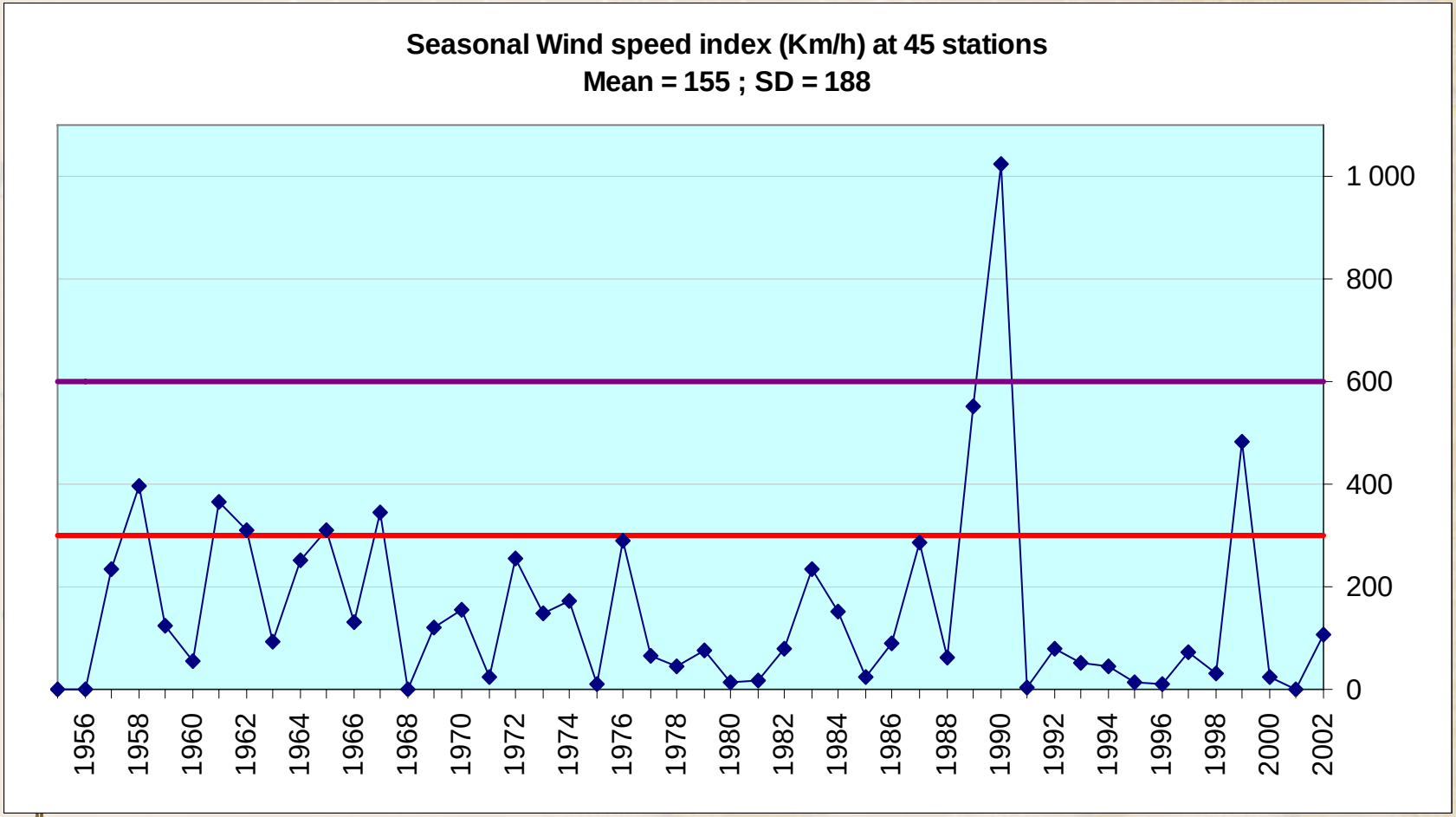
Index Based Reinsurance example: Wind trigger and frequency of damages

- **Weather risk exposure:**
  - Property and motor physical damages due to strong storms are strongly correlated to the wind speed
- **Solution:**
  - January-December SL treaty
  - 45 weather stations spread over 5 European countries
  - Each station has a specific weight
  - Each station has a specific wind speed threshold high enough to capture storms (e.g. 110 Km/h)
  - Each station has a specific wind speed limit close to the threshold (e.g. 115 km/h) as to capture storms frequency only

Index Based Reinsurance example: Wind trigger and frequency of damages



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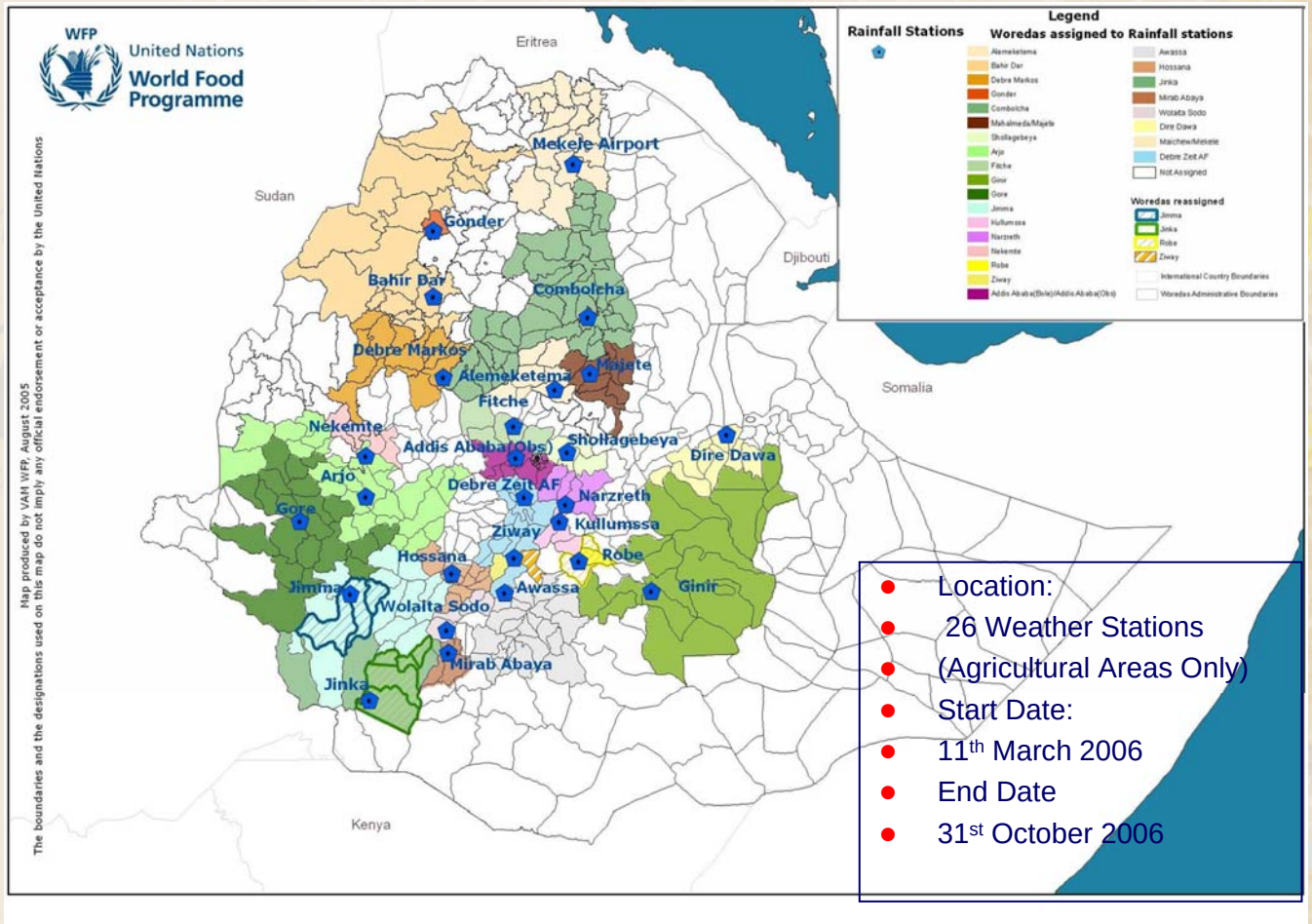
Humanitarian Aid: Ethiopian Structure

- Target : to establish contingency funding for an effective aid response for the WFP
- Rapid availability of funds: More efficient Aid
- Vehicle : based on FAO's crop water balance model and 26 primary weather stations with daily data
- Structure defined by crop and by weather station.

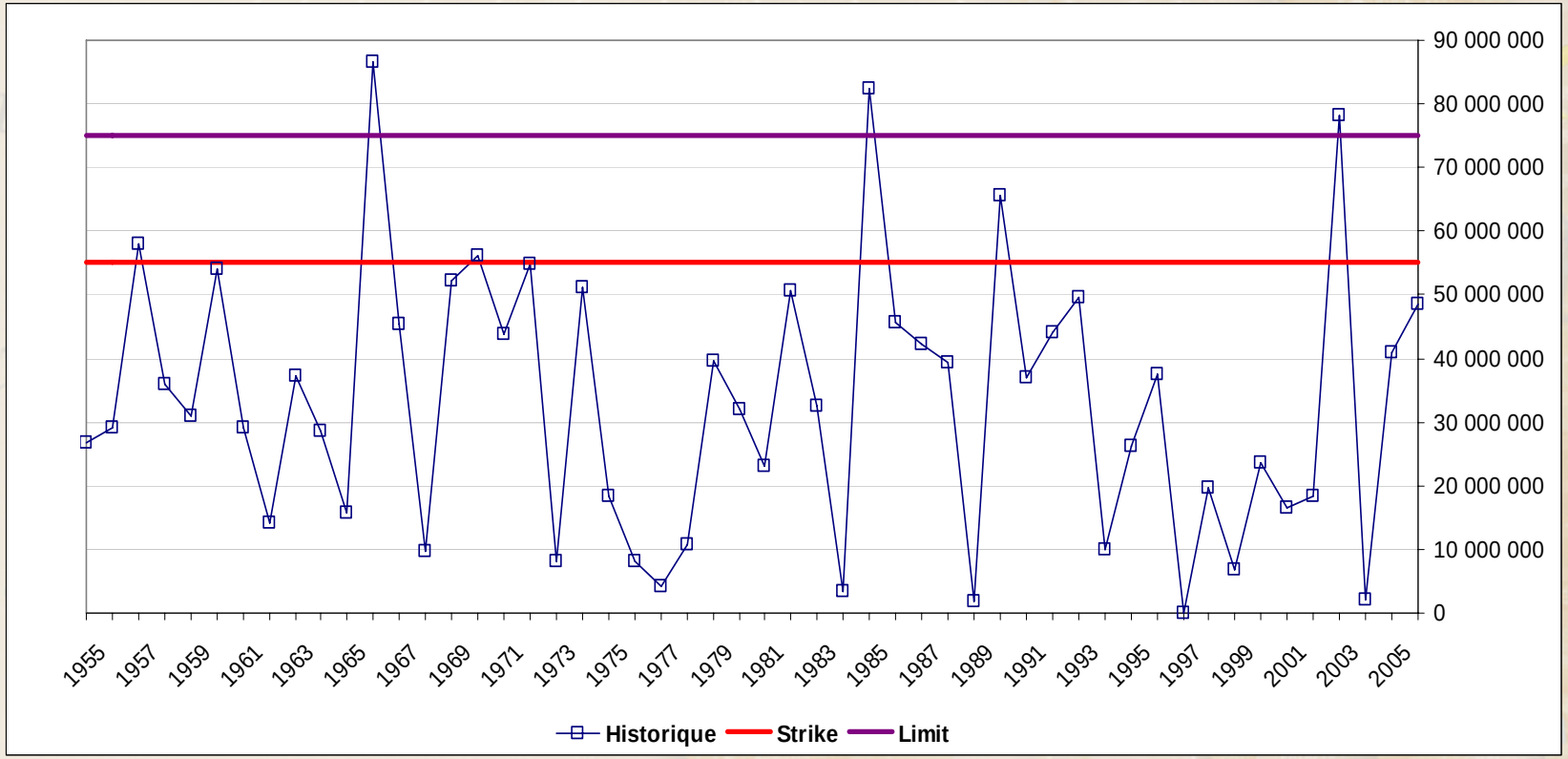
Humanitarian Aid: Ethiopian Structure



- Location:
- 26 Weather Stations
- (Agricultural Areas Only)
- Start Date:
- 11th March 2006
- End Date
- 31st October 2006

Humanitarian Aid: Ethiopian Structure

Ethiopia drought Index value



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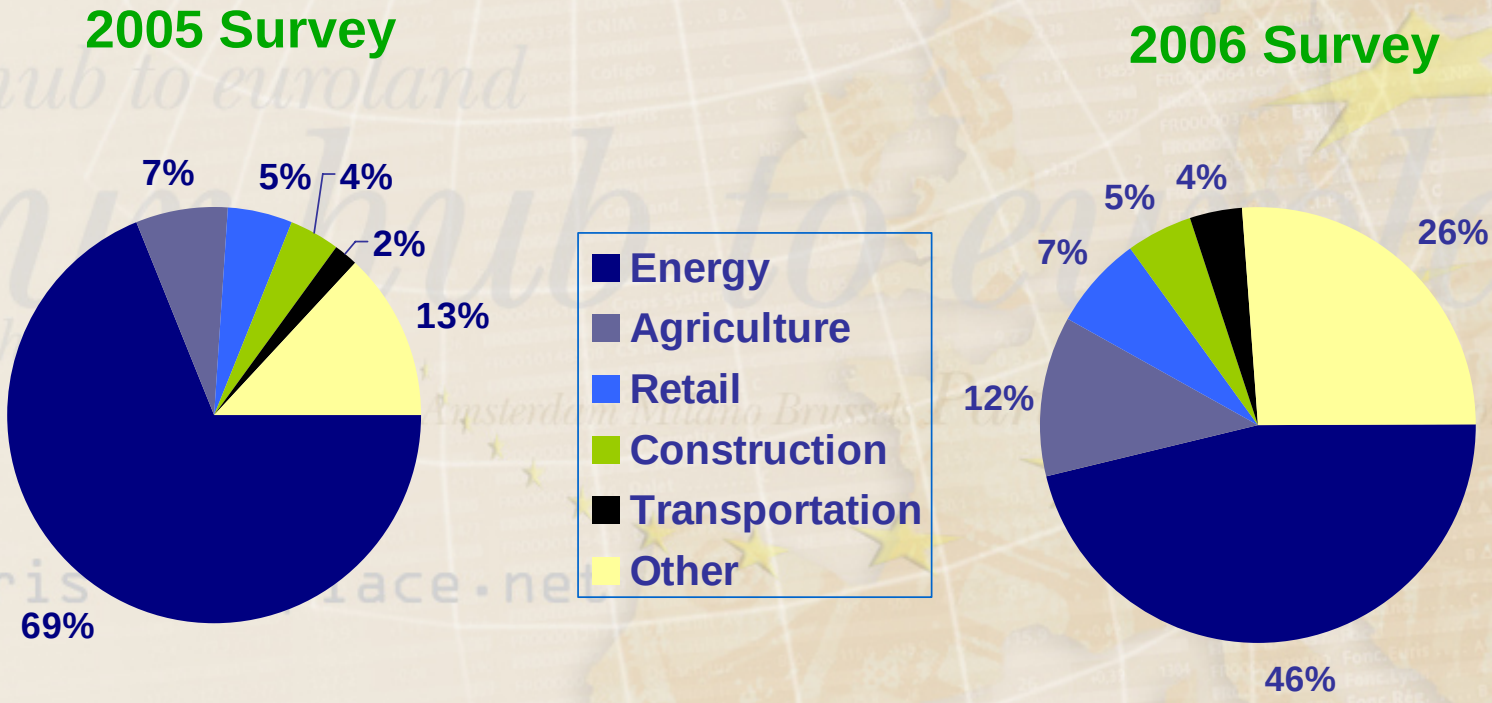
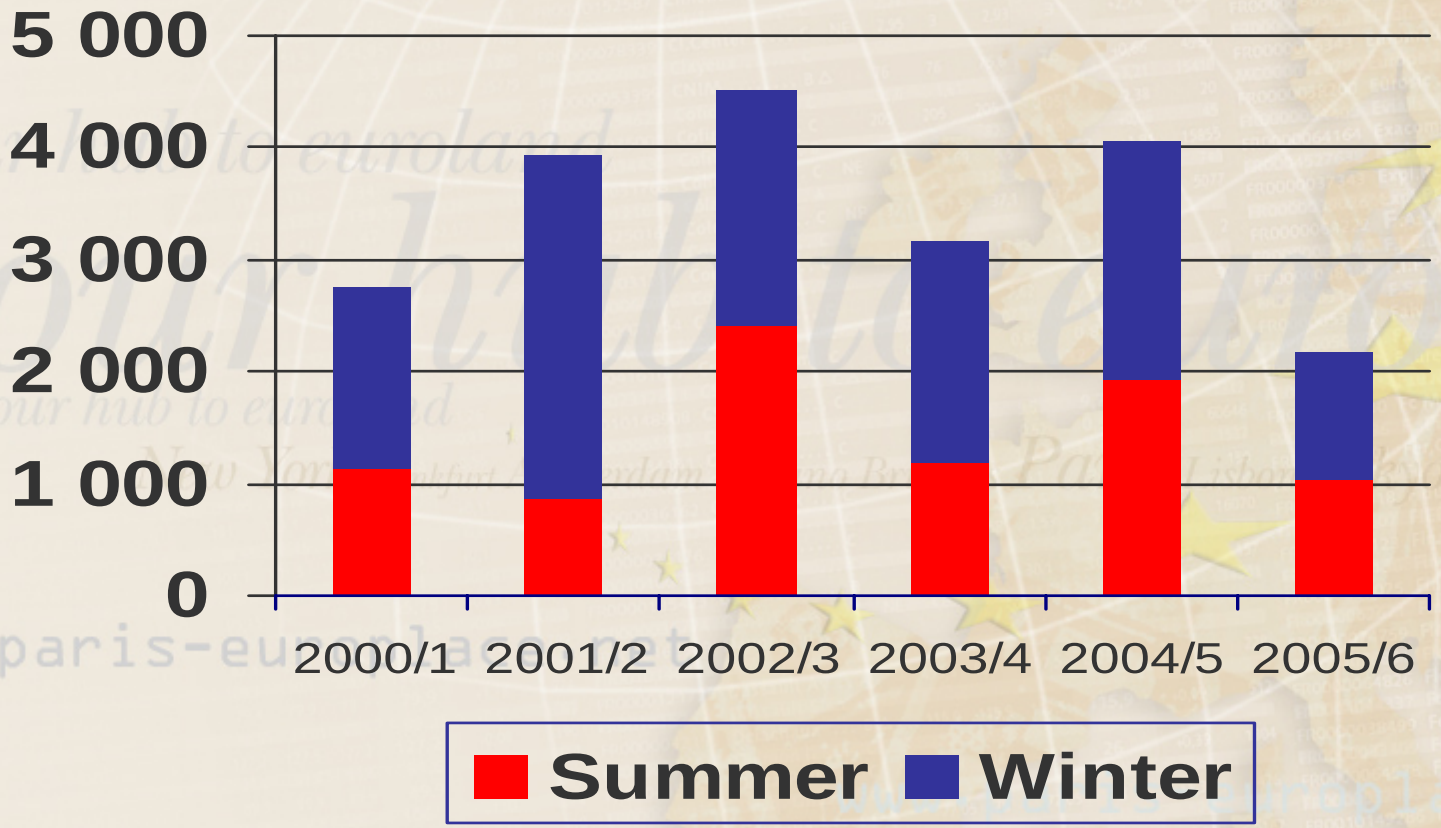
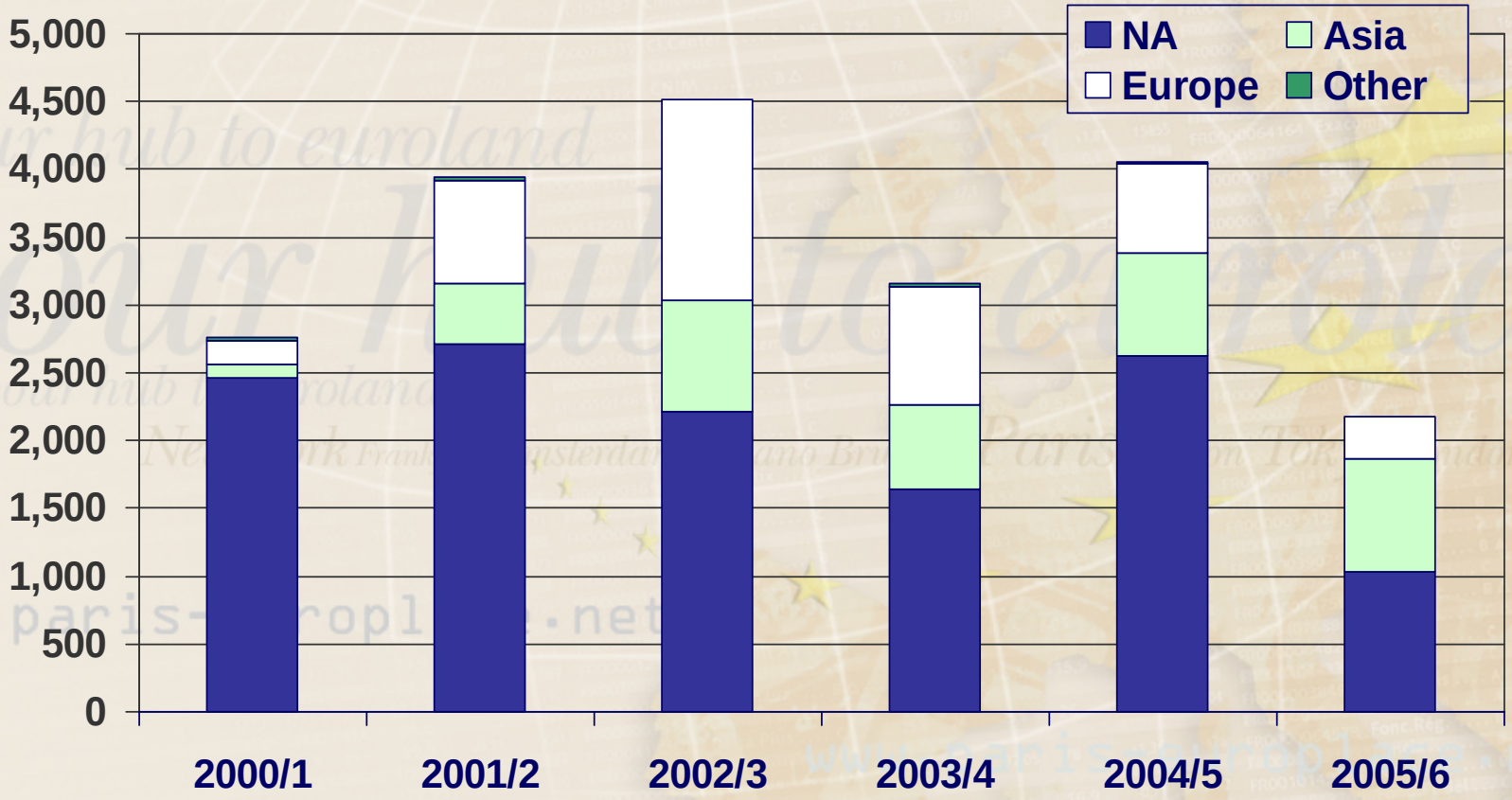
Market figures: Distribution of Inquiries, by Sector of Potential End-User (OTC)



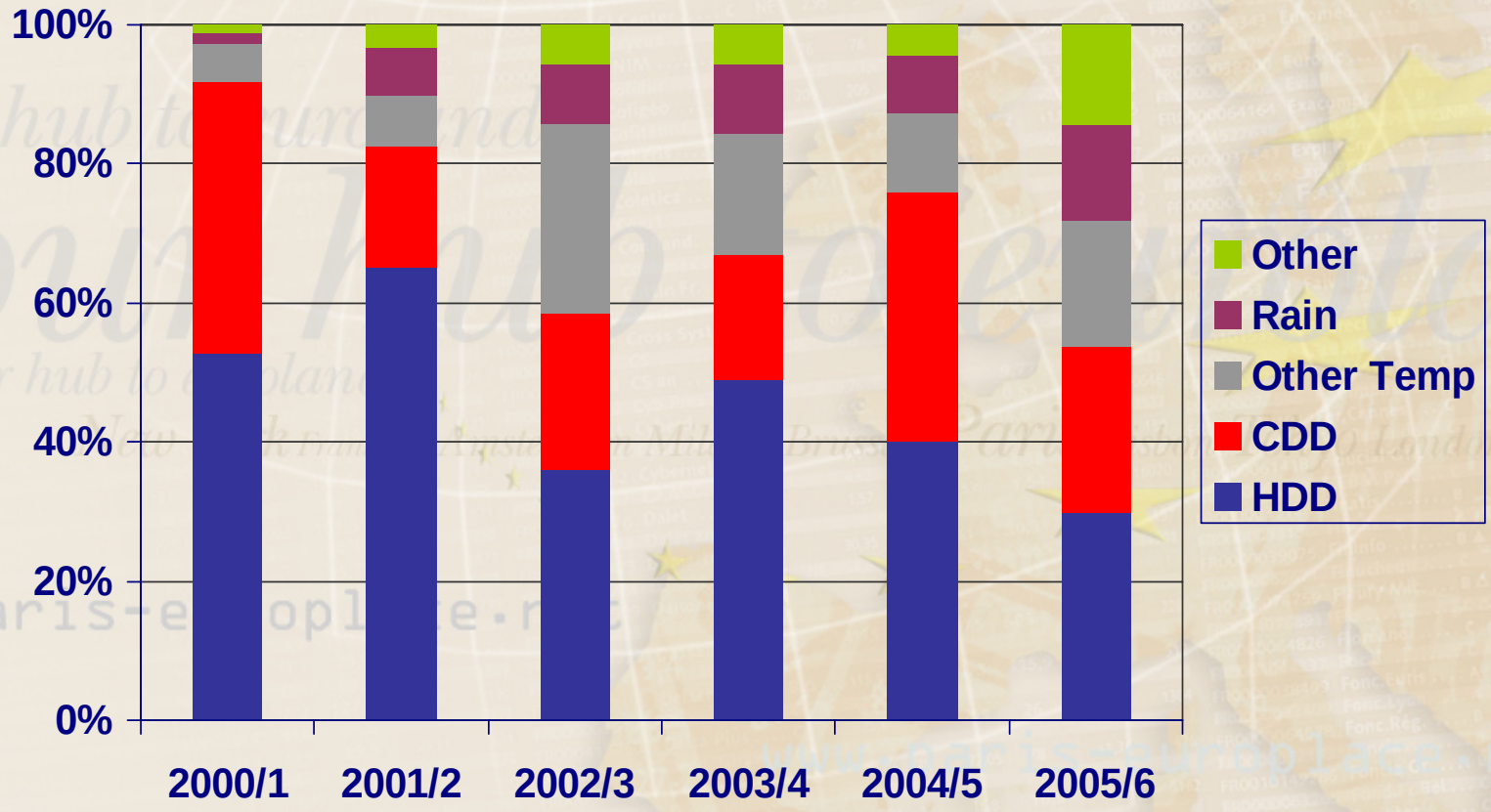
Market figures: Number of Contracts (OTC)



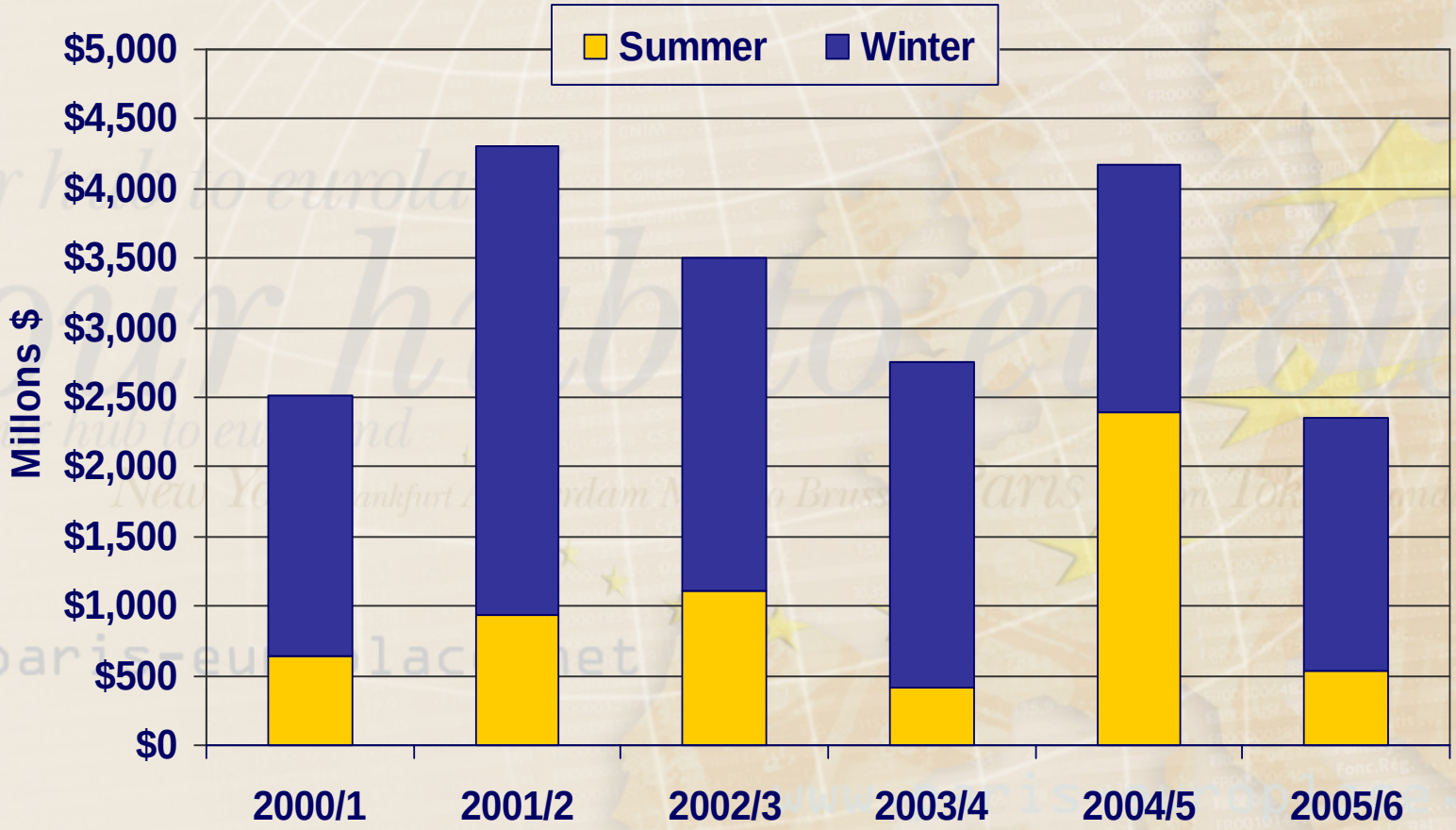
Market figures: Distribution of Total Number of Contracts by Region (OTC)



Market figures: Distribution of Number of Contracts by Type (OTC)



Market figures: Total Notional Value (OTC)



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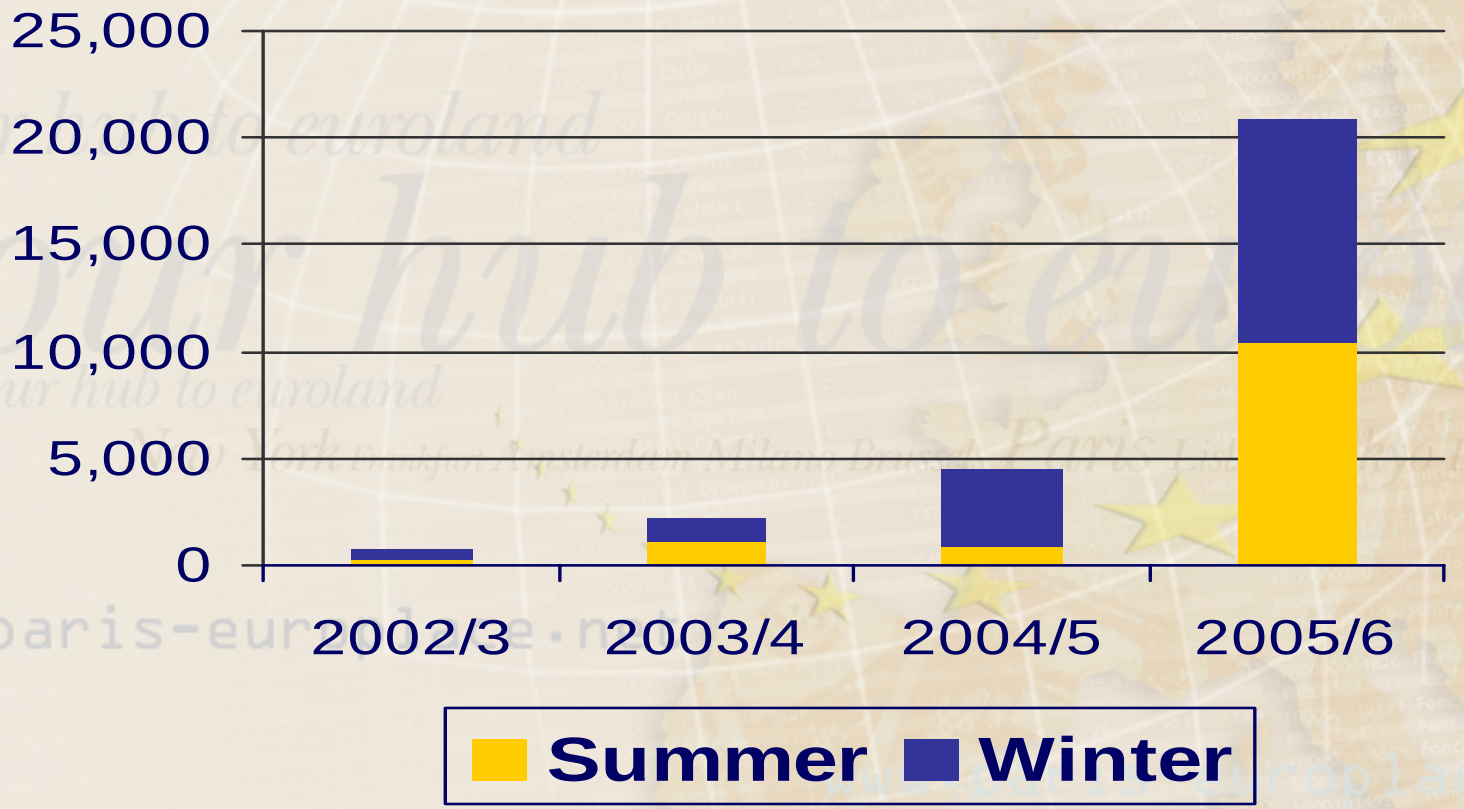
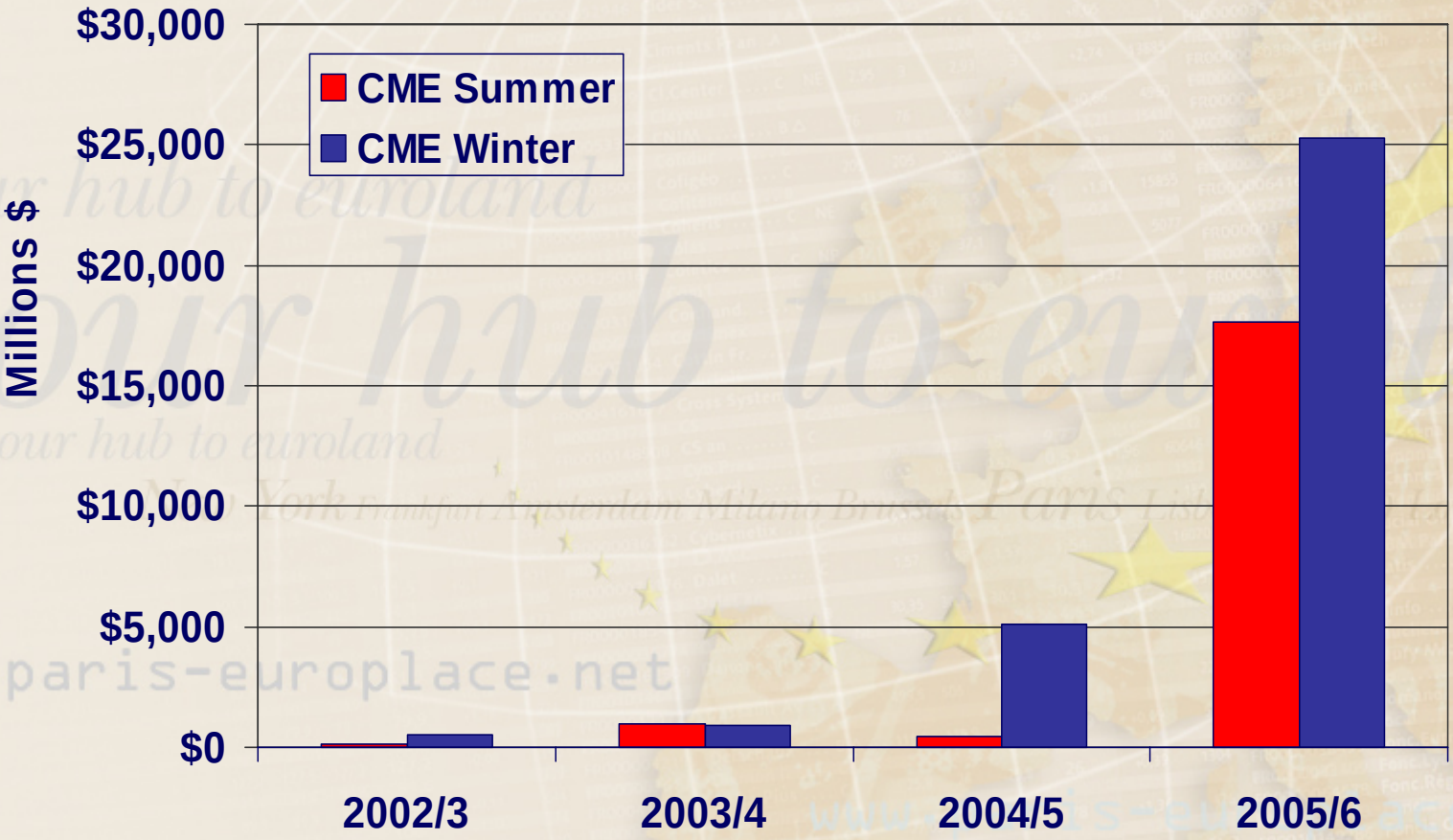
Market figures: Number of Trades on the CME



Market figures: Total Notional Value on the CME



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