

# Implementation of integrated risk management system of a bank

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**Global Risk Management Practices and  
Emerging Market's Particular Issues**

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# Agenda

- Russian RMS Market Trends
- Russian RMS Market Map
- Implementation of integrated RMS in practice

# Russian RMS market is young

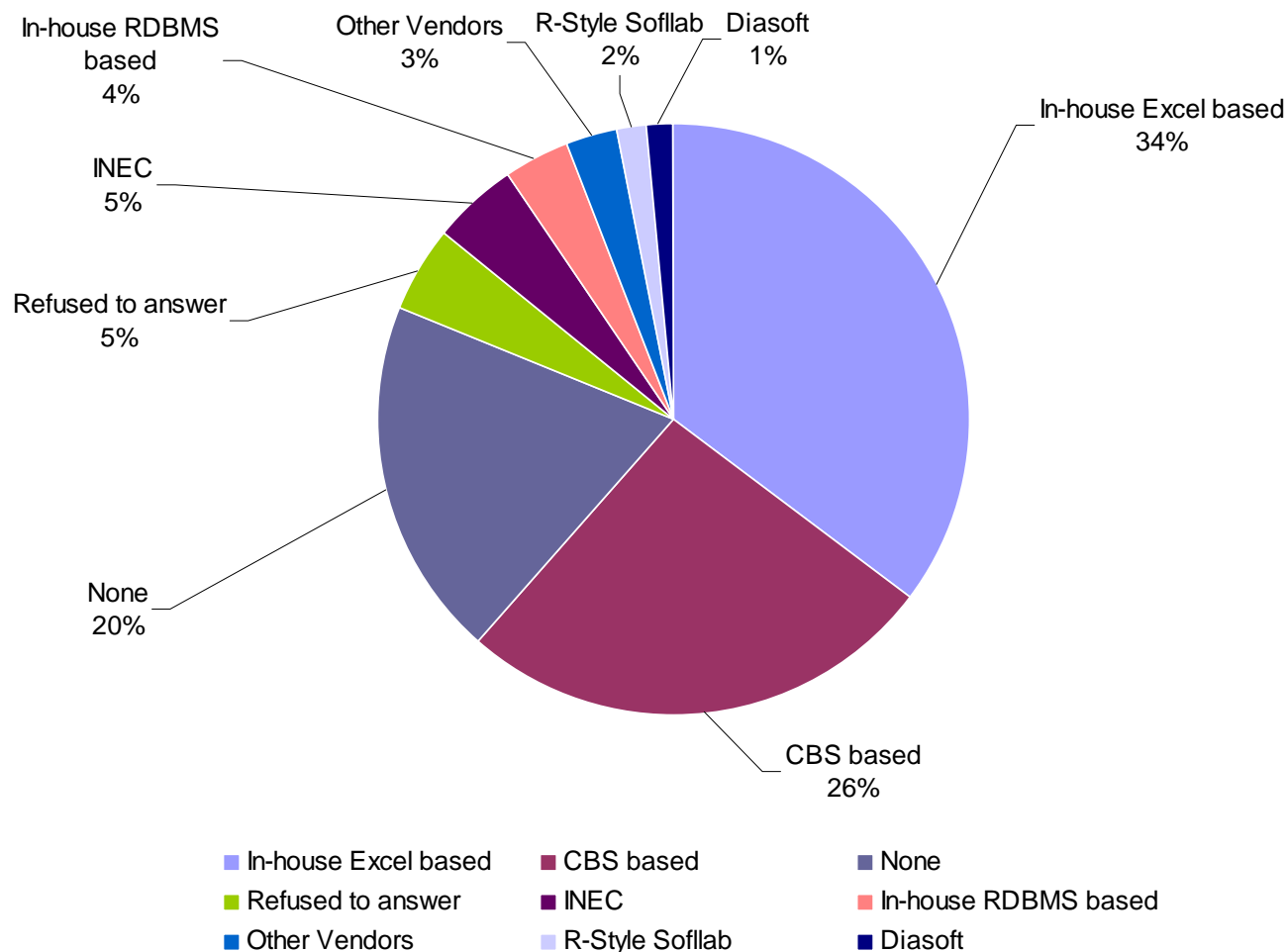
In 2005 only **half** of the banks had RMS at place

In 2006 it is more than **80%**

Source: Analytical Banking Journal, 2007, #3 (142)

[http://www.absonline.ru/phparticles/show\\_news\\_one.php?n\\_id=379](http://www.absonline.ru/phparticles/show_news_one.php?n_id=379)

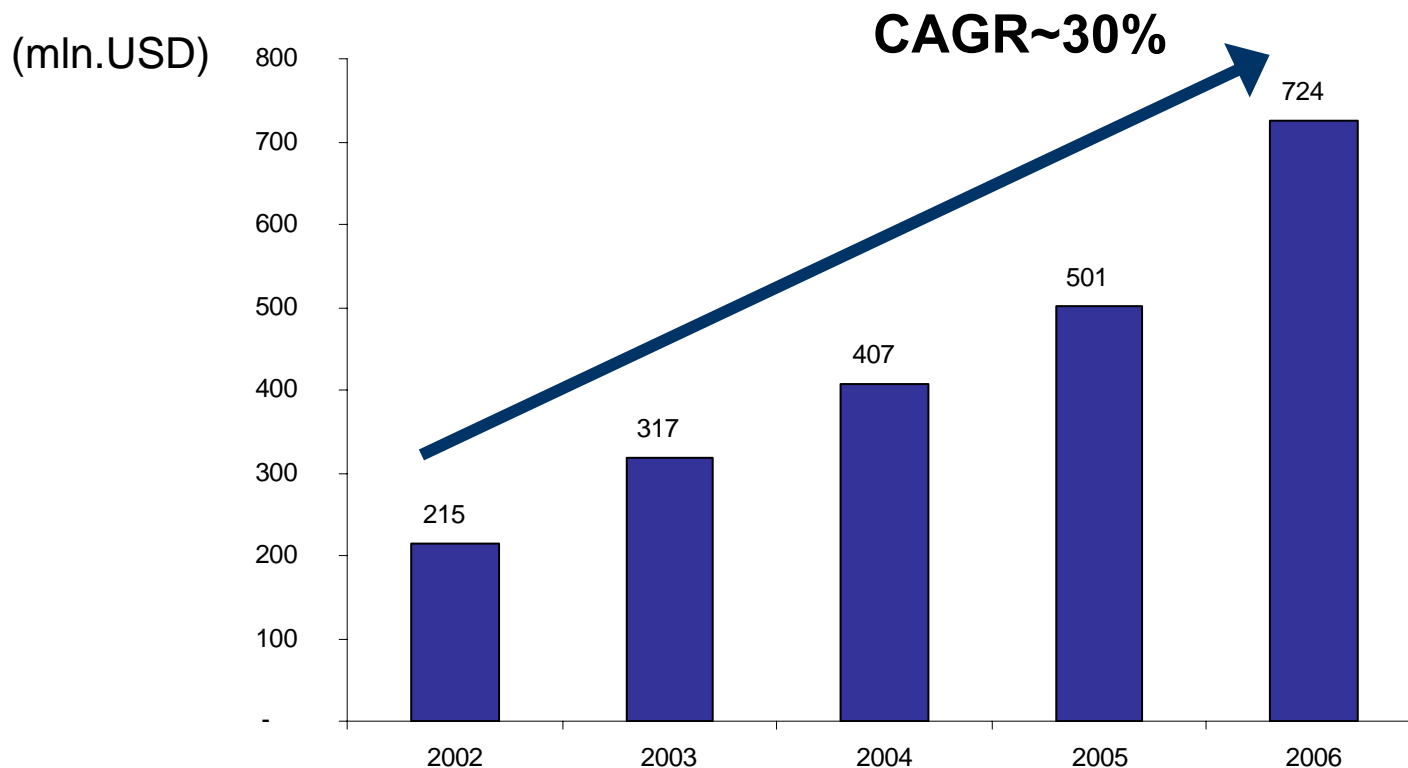
# 34% of RMS are In-house Excel based...



Source: Analytical Banking Journal, 2007, #3 (142)

# IT Budgets are rising...

Total IT budget of Russian banks will probably reach \$1 bln in 2007



Source: PROGNOZ research

# Typical IT budget is less than 400 k\$

IT budget of a typical Russian bank is 200-400 k\$

Source: PROGNOZ research

40% of the budget is spent on software

Source: CNews Analytics

**Compare with:**

‘Individual financial institutions invest an average of \$10 million annually in risk management technology’

Source: IDC Research

# Russian RMS Market Map

## Russian Vendors

### Integrated RMS Platforms:

- EGAR Risk Systems
  - INEC FRM
- PROGNOZ Risk Management

### Niche Vendors:

- IIG, Intersoft Lab.
  - Forecsys
- RRM, Softwell

### CBS Vendors:

- R-Style
- Diasoft
- FORS

## In-house Development

- MS Excel
- MS Access
- Matlab...

CBS based

## Foreign Vendors

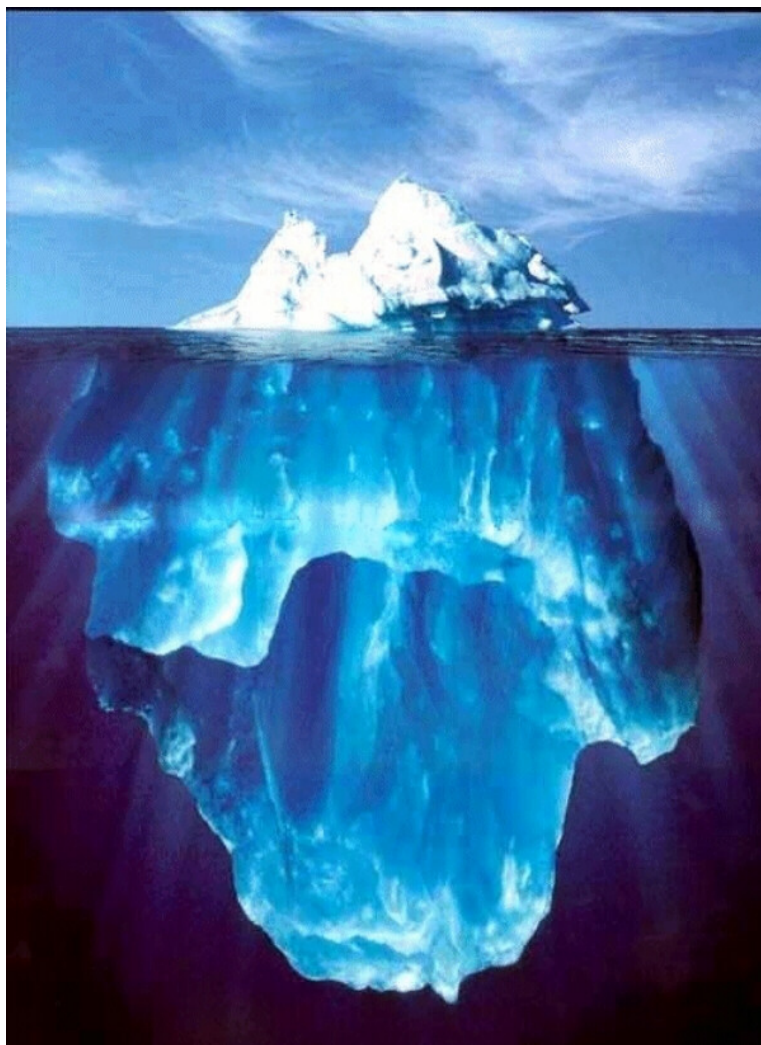
### RMS Vendors:

- SAS Risk Management
- Oracle FSA + Reveleus
  - IPS-Sendero RMS
    - AIM-Software
    - Algo Suite
    - IRIS RMS
  - Reuters KVAR
  - Ksema KXEN
- Trema Asset Mngmt

### Consulting Companies:

- Bearing Point
- Ernst and Young
- Deloitte ...

# Implementation of integrated RMS in practice



Risk Reports – 10%

- VaR reports, dashboards, etc.

Risk Engine – 10%

- VaR, stress-testing, backtesting, etc.

Risk Data – 80%

- data feeds mapping
- data extraction (ETL)
- data cleansing
- data recovery
- manual input, etc.



# Risk Data

## Internal Data

MR

### What?

Portfolios  
Positions  
Deals

### Where?

Front-office, Back-office  
DW  
Files..

CR

Deals  
Defaults  
Recovery

Front-office, Back-office  
DW  
Files..

## External Data

MR

### What?

Prices  
Descriptions

### Where?

Bloomberg (DDE, API, FTP)  
Reuters (DDE, API, Bridge)  
SE, Agencies, Internet

CR

Cpty data

Banks: 101, 102, 134, 135, IAS  
Others: 1,2,3,4,5, IAS

# Risk Engine

- Power
- Computational speed
- Open architecture (not a 'Black box')
- Extendibility
- GUI

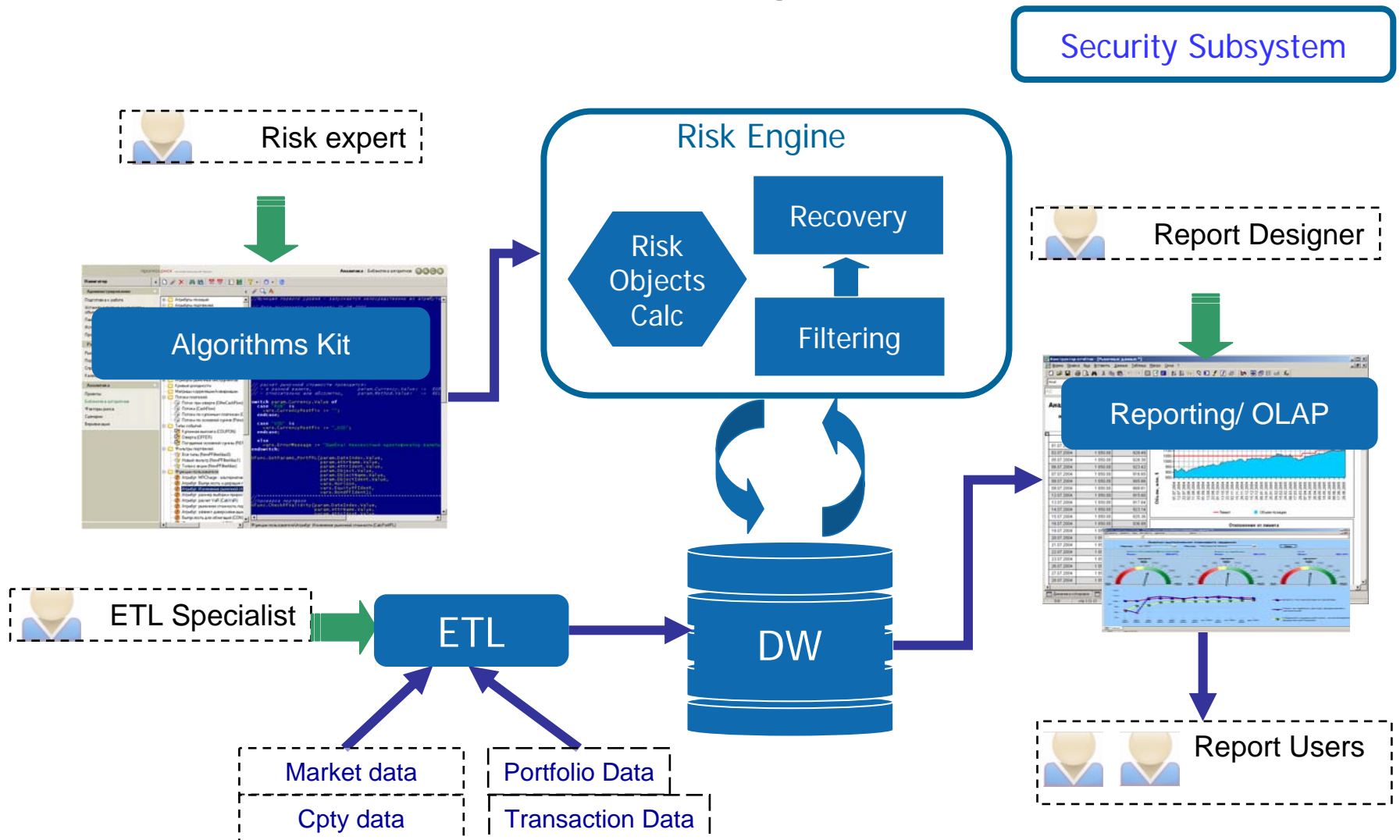
# Risk Reporting

- Easy configuring
- Must look good

# Other Requirements

- Multi User Environment
- Enterprise RDBMS
- Modular Structure
- Information Security

## PROGNOZ Risk Management



The screenshot displays the Prognoz.Risk application window. The title bar reads "Prognoz.Risk - 1.5.01(14.02.2006)". The interface is divided into several sections:

- Navigator:** Contains a "Security Management" section and a tree view of the "Algorithms Kit". The tree view includes categories like "Cashflows", "Covariance matrices", "Events types", "Instruments calculated fields", "Sensitivity figures", "Portfolio filters", "Portfolios calculated fields", "Pricing functions", and "User-defined functions".
- Code Editor:** Displays the "PROGNOZ Risk Object Language" code. The code is a complex script with variables and conditional logic for bond pricing and event handling.

**Algorithms Kit**

- Cashflows
  - Cash flow (CashFlow)
  - Cash flow for embedded option (if any) (CashFlowWithOption)
  - Coupon cash flow (Coupon)
  - Repayment cash flow (Principal)
- Covariance matrices
  - Covariance matrix
- Events types
  - Coupon payment (COUPON)
  - Coupon payment, % (COUPON\_PERC)
  - Offer (embedded option) (OFFER)
  - Principal payment (REPAYMENT)
- Instruments calculated fields
  - Bond analysis
    - Equity analysis
    - Option analysis
      - Sensitivity figures
        - Delta (Delta)
        - Gamma (Gamma)
        - Theta (Theta)
        - Vega (Vega)
      - Option price (OptionPrice)
- Portfolio filters
  - Government Bonds (GovernmentBonds)
  - Corporate Bonds (CorporateBonds)
  - Filter (Filter)
- Portfolios calculated fields
  - Backtesting
  - Decomposition
  - For limits
  - Market Value
  - Other
  - Other risk measures
  - Risk Measures
  - Volatility analysis
  - New attribute (NewAttrAlias)
- Positions calculated fields
  - Market Value
  - Other
  - Risk Measures
- Pricing functions
  - Bonds pricing function, quote-based (PrBondsQuote)
  - Bonds pricing function, reference-based (PrBondsRef)
  - Bonds pricing function, yield curve-based (PrBondsYield)
  - Bonds pricing function, yield-based (YTM) (PrBondsYTM)
  - Equities pricing function, index-based (PrEquitiesIndex)
  - Equities pricing function, quote-based (PrEquitiesQuote)
  - Options pricing function (OptionPF)
- User-defined functions
  - Yield curves

**PROGNOZ Risk Object Language**

```

var
  a;
  b;
  c;
  d;
  e;
  sd;
  1;t;CDIdx;YearDays;
  CouponValue; CouponNum; LastCouponDateIndex;
  A1,B1;
endvar;

if(StrUpperCase(M.Type) = "EUROBONDS") then
  vars.sd := 3;
else
  if(StrUpperCase(M.Type) = "BONDS") then
    vars.sd := 0;
  else
    vars.sd := 0;
  endif;
endif;
vars.a := 0;
vars.CDIdx := IncWorkDate(DateIdx, vars.sd, M.CalendarID);
vars.YearDays := YearDayCount(vars.CDIdx, M.DAY_CNT_DES);
for vars.i := 1 to EventsCount do
  if (GetEventDateIndex(vars.i) > vars.CDIdx and (R.CashFlow[GetEventDateIndex(vars.i)] <> nodata) then
    vars.t := DayCount(GetEventDateIndex(vars.i), vars.CDIdx, M.DAY_CNT_DES);
    vars.a := vars.a + R.CashFlow[GetEventDateIndex(vars.i)] *
      (1 + F.YTM.Value / 100 / (M.CPN_FREQ_YLD_CNV*1)) ^ ((-1) * vars.t * (M.CPN_FREQ_YLD_CNV*1) / vars.YearDay
    endif;
endfor;

vars.b := M.PAR_AMT*1;
for vars.i := 1 to EventsCount do
  if (GetEventDateIndex(vars.i) < DateIdx) then
    vars.b := vars.b - R.Principal[GetEventDateIndex(vars.i)];
  else
    break;
  endif;
endif;
endfor;
vars.CouponValue := nodata;
vars.CouponNum := 0;
vars.LastCouponDateIndex := 0;

for vars.i := 1 to EventsCount do
  if ((GetEventDateIndex(vars.i) <= vars.CDIdx) and
    (R.Coupon[GetEventDateIndex(vars.i)] <> NoData) and
    (R.Coupon[GetEventDateIndex(vars.i)] <> 0))
  then
    vars.CouponNum := vars.CouponNum + 1;
    vars.LastCouponDateIndex := GetEventDateIndex(vars.i);
  endif;
endif;

if ((GetEventDateIndex(vars.i) > vars.CDIdx) and
  (R.Coupon[GetEventDateIndex(vars.i)] <> NoData) and
  (R.Coupon[GetEventDateIndex(vars.i)] <> 0))
then
  vars.CouponValue := R.Coupon[GetEventDateIndex(vars.i)];
endif;

if vars.CouponNum = 0 then
  vars.A1 := DayCount(GetEventDateIndex(vars.i), GetIndex(StrToDate(M.ISSUE_DT)), M.DAY_CNT_DES);
  vars.B1 := DayCount(GetEventDateIndex(vars.i), vars.CDIdx, M.DAY_CNT_DES);
else
  vars.A1 := DayCount(GetEventDateIndex(vars.i), vars.LastCouponDateIndex, M.DAY_CNT_DES);
  vars.B1 := DayCount(GetEventDateIndex(vars.i), vars.CDIdx, M.DAY_CNT_DES);
endif;

break;
endif;
endfor;
    
```

Scenario Analysis Report - [Portfolio Backtesting (Static) \*]

Формат Правка Вид Вставить Данные Таблица Макро Окна ?

Анал

Q35

## Portfolio Market Risk Backtesting

**Procedure:** Backtesting Procedure      **Calculation:** Verification - 17.02.2006

**Portfolio:** Sample Portfolio      **Method:** Backtesting Method Price USD 0.97

**Date:** 13.01.2006

Index	Backtesting Method_PRICE_USD_0.97_STOCKSPF_0_1_P/
Average exception value	
Average unused reserves	
Color Zone	
Cumulative exception	
Number of exceptions	

	VaR estimate	Portfolio value change	Portfolio value change, %	
24.05.2005	768.78	162.22		
25.05.2005	759.56	227.85		
26.05.2005	753.02	-677.53		
27.05.2005	760.63	435.61		
30.05.2005	763.69	-670.94		
31.05.2005	770.33	-892.04		
01.06.2005	791.95	-413.02		
02.06.2005	784.00	544.90		
03.06.2005	793.11	-222.87	-0.24	0.85
06.06.2005	781.53	155.41	0.17	0.84
07.06.2005	772.89	390.46	0.42	0.83
08.06.2005	773.08	-214.94	-0.23	0.83
09.06.2005	761.74	-116.63	-0.12	0.82
10.06.2005	749.67	-840.66	-0.90	0.80
13.06.2005	769.50	-187.57	-0.20	0.83
14.06.2005	758.32	-541.19	-0.59	0.82
15.06.2005	757.73	196.40	0.21	0.83
16.06.2005	749.93	-154.36	-0.17	0.82
17.06.2005	738.23	1 244.69	1.36	0.80
20.06.2005	827.45	-787.59	-0.85	0.88

**Portfolio market value changes vs. VaR estimation**

91 674.31
91 870.71
91 716.35
92 961.03

Backtesting

35:16    стр 2 (2-1)

## PROGNOZ

- Established in 1991
- 400+ employees
- ISO 9001:2000 certified
- Headquarter in Perm, branches in Moscow, Beijing, Philadelphia
- 4<sup>th</sup> in TOP-10 Russian software developing companies rating (RA-Expert)
- Risk expertise since 2002





Thank you.

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**Information**

www.prognoz.ru