

PROGRAMME DESCRIPTION

EURANDOM EIBURS PROPOSAL

Quantitative analysis and analytical methods to price securitization deals

INTRODUCTION

This document is the EURANDOM application for the EIBURS sponsorship on the topic “Quantitative analysis and analytical methods to price securitization deals”.

This project involves five components.

1. A research project on the quantitative modelling, analysis and assessment of important risks in ABSs, CLOs and other securitization deals.
2. The organization of an annual workshop on the state-of-the-art, recent developments and new directions in the field of securitizations.
3. The embedding of seminars on the above topic into the running EURANDOM Multivariate Risk Modelling seminar series.
4. The organization of training sessions for EIB personnel related to Credit Risk Modelling and Securitization.
5. An extensive visitors programme related to the research project and open for EIB personnel.

The proposal involves the employment of one new postdoctoral researcher, who will be hosted at the international research Institute EURANDOM (Eindhoven, The Netherlands). The research projects fits into the current research line of the “Multivariate Risk Modelling” programme at EURANDOM. The project will be supervised by senior EURANDOM staff.

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I. Research Project

a) Project Summary

This project will model and assess the important risks for the pricing, hedging and risk management of Collateralized Loan Obligations (CLOs) and a portfolio of Asset Backed Securities (ABSs). Recent market developments have brought up at least two new market instruments designed to hedge portfolios of loan and ABS based securities: iTraxx LevX and LCDX (the indices of CDSs on loans (LCDSs)) and ABX (the index of CDSs on ABSs). After understanding the points in traditional models and cash flows analysis for ABSs and CLOs for rating, pricing and expected loss estimate purposes we would venture on improving them by using stochastic models that have already proven their modelling abilities in other areas of finance (see Schoutens 2003, Cariboni and Schoutens 2007, Garcia et al. 2007).

A main goal of this project is to establish a theoretical framework for the pricing, hedging and risk evaluation (both systemic and idiosyncratic) of a portfolio of loans and ABSs under realistic and tractable stochastic models. After an understanding of the standard pricing (and eventually rating) methodologies for ABSs and CLOs instruments we intend to develop a cash flow model application to estimate a CLO expected loss and maturity starting from the analysis from the pool of assets and the liabilities side. The second phase of the research will move forward and study those instruments in the new scope of the credit derivatives markets. This will be done by comparing pricing methodologies for CDSs of ABS's (ABCDSs), CDS's of loans (LCDSs) and their respective indices to be used as hedges for both systemic (in the case of the indices) and idiosyncratic credit risks. Important issues on this project will be evaluating default probabilities, cancellability issues (on loan CDSs) and prepayment modelling (on ABCDSs), how those issues impact the indices on those instruments (LCDX and ABX) and how to count for correlation on those portfolios. Finally, we want to develop tools for risk and hedge purposes for portfolios of ABSs and CLOs.

The originality of the project lies in two important aspects. Firstly on the pure methodological side is the fact that quite advanced but tractable stochastic models will be applied in the modelling of ABS and CLO products. And secondly we will be studying to those instruments and their portfolios in the light of the most recent market developments namely the indices of CDSs on loans and ABSs.

b) State-of-the-art and Objectives

ABSs are notes based on pools of assets, or collateralized by the cash flows from a specified pool of underlying assets. On the side of the originator one of the most important features behind "securitization" is the separation between the collateral (the underlying asset pool) and the originator. In recent years with the advent of Basel II, the efficient use of capital and the integration of the European capital market, the European securitization market has increased significantly. Recent developments include the use of credit derivatives to create synthetic credit exposures and credit risk transfers in what is called synthetic securitization. Moreover synthetic **Collateralized Debt and Loan Obligations** (CDO and CLOs respectively) combine securitization features with credit derivative technologies.

On the investor side securitization instruments permit traditional portfolio managers to have access to more exotic asset classes for which they would not have access otherwise. Or in another way, securitization permits one to pack more risky or exotic asset classes to be available for investment by a broader set of investors. In principle the asset pools can be made of any type of receivable. Additionally, ABSs are then attractive to investors because they give them exposure to a diversified pool of consumer or corporate assets. Instead of buying loans or bonds in a number of industries or geographic areas and building up such a portfolio alone, investors can simply buy into a CLO which is already such a portfolio.

In a synthetic CLO the originating bank does not transfer the loans off its books but merely transfers the credit risk in the loans by issue of credit default swaps. The reference asset is the loan held by the bank - as the credit risk in the loans is transferred to the Special Purpose Vehicle (SPV) and from there on to the investors while the originating bank achieves regulatory capital relief.

Over the last few years, the popularity for holding CLOs as part of an investment portfolio has increased substantially. CLOs, in addition to strengthening the overall portfolio diversification, also provide attractive returns in a relatively low risk and low volatility environment. The tranching of the capital structure enables investors to purchase CLO tranches to suit their own particular risk/return preferences, and is therefore appealing to a wide range of different investors.

Different asset classes give rise to different ABS structures. The important element in these structures is to match the cash flows generated by the assets with the cash flows required to service the asset-backed security.

In dealing with CLOs one has to take into account not only default issues but also prepayment features as borrowers may have access to cheaper financing and close their positions earlier. Hence prepayment clauses may affect significantly the expected maturity (duration) of the CLO notes and as such the rate of return of the investment.

This project will model and assess the important risks for the pricing, hedging and evaluating the expected loss of ABSs and CLOs by using stochastic models that have already proven their modelling abilities in other areas of finance.

This project aims to analyse the risks present on ABSs and more particularly CLOs. The modelling of these products can be very similar to the modelling of corporate CDOs: defaults are one of the major risks. EURANDOM has considerably experience with the modelling of CDOs and other credit risk instruments (see Section Current Research). The modelling of CLOs is thus a natural extension of the current research projects. However there is a subtle but important differences between CLOs and CDOs: the prepayment feature built into the former, the accessibility and transparency of underlying pool data. This extra features makes the modelling much more involved. This project will take all the expertise present of the CDO modelling and extend it, where it is possible, to models in which prepayment is incorporated.

The research milestones for the project are the following:

- 1) Establish a theoretical framework for the pricing, hedging and evaluating the expected loss (both systemic and idiosyncratic) of a portfolio of loans /CLOs and ABSs under realistic and tractable stochastic models.
- 2) Develop an application that models the pool of asset and the liabilities side in order to measure the expected loss and the expected average life of a CLO transaction.
- 3) Develop pricing methodologies for ABCDSs and LCDSs and their respective indices.
- 4) Study the potential use of the above products as hedges for both systemic (in the case of the indices) and idiosyncratic credit risks.
- 5) Model default probabilities, cancellability issues (on loan CDSs) and prepayment regimes (on ABCDSs).
- 6) Study how those issues impact the indices on those instruments (LCDX and ABX) and how to count for correlation on those portfolios.
- 7) Compare the models investigated with rating agency approaches.

c) Methodology

Default Modelling

There are essentially two largely used approaches for the modelling of credit instruments and the default process. The first approach is a structural one, linking the occurrences of default directly with the reference entity's value behaviour. Default happens if the value falls below a certain low threshold. The approach uses techniques and stochastic processes that are also used in equity modelling. The other approach is an intensity based framework in which default happens exogenously.

Stylized features of the financial data in a credit risk setting are non-normal (i.e. non-Gaussian) returns, heavy tailedness and, very important, jump dynamics. Defaults and credit risk are driven by shocks. Modelling default risk without jump dynamics may not be realistic and may severely underestimate the risks present. Therefore using the standard approach (that implies normal assumptions) may not be able to perform a correct assessment of the risks involved.

In order to improve the modelling assumptions in the credit instruments, more advanced techniques that include jump processes may be desirable. Jump models (Lévy models) have been very successful in other fields in finance, like equity, interest rate and volatility modelling. The research team has an already extensive number of publications in these areas.

Prepayment Modeling

In dealing with CLOs crucial in the modelling is also a realistic assessment of the prepayment features typically built into the underlying loans. One way of incorporating prepayment features is by the determination of the constant prepayment rate (CPR). Given the importance of CPR's in CLOs and ABSs one can already expect that a good part of the project will be devoted to dealing with the way to incorporate an as simple as possible model for CPR to be put on the pricing models.

II. Resources

a) International Research Team

The above research plan will be performed at the EURANDOM institute. The project will be hosted by the “Multivariate Risk Modelling” group, which is supervised by Prof. dr. Wim Schoutens and Em. Prof. dr. Jef Teugels. The group consists for the moment of 2 postdocs and a vacant position for a doctoral student (which will be likely filled in the coming weeks). The “Multivariate Risk Modelling” group is embedded in the larger “Queueing and Performance Analysis” group which consists of a group of around 10 researchers and an international steering committee. Although the name, because of some historical reasons, refers solely to queueing modelling, the actual research is quite broad and essentially focuses on the use of stochastic processes in different areas of applications: from queueing models in telecommunications to default modelling in finance. The research project will benefit from this broader expertise on stochastic processes. Typically stochastic processes can be used in a huge variety of applications. Quite often the same stochastic processes are used as the essential building blocks in the applications. Theoretical results about these processes carry over to different fields of applications.

The “Multivariate Risk Modelling” group has recently already acquired some external funding, via a two-year Marie Curie Fellowship of the European Community, and a one-year fellowship from the Flemish Science Foundation FWO.

b) EURANDOM Institute

EURANDOM, operational since 1998, is a research institute in statistics, probability and stochastic operations research and its applications, as well as its interfaces with other disciplines. Stochastics consists of statistics, probability and stochastic operations research. The core business of EURANDOM is fundamental research in an international environment, carried out by a select and non-tenured staff of junior researchers and senior advisors, supplemented with an extensive programme of seminars, workshops and visitors. EURANDOM is engaged in many activities on a local, national and international scale, making it an important research facility in Europe.

The mission of EURANDOM is to foster research in stochastic sciences and their applications by:

- recruiting and training talented young researchers and helping them to find their way to tenured positions in academia and industry;
- carrying out and facilitating research through postdoctoral and graduate appointments, visitor exchange and workshops;
- taking initiatives for collaborative research at the European level.

At the moment the institute hosts about 25 junior researchers, mainly postdocs with a two-year appointment. They are being guided by 12 senior researchers with a temporary appointment for - typically - one day per week. The scientific director, Prof. dr. Onno Boxma, has the overall scientific responsibility. He maintains extensive contacts with the advisors and develops the scientific strategy for the institute. The management and bureau (4 full time employees) supply support.

The institute has a strong international orientation. The vast majority of the junior researchers (88 out of 108 so far), of the program steering committees, and of the scientific council is non-Dutch. Furthermore, EURANDOM has a very extensive visitor program (on average 40 -50 visitors per year), and it organizes about 10 workshops per year, most participants coming from abroad.

EURANDOM has rapidly acquired an excellent reputation in the international stochastics community, as is, a.o., reflected by the large number of high-quality postdoc applications. The excellent outcome of the peer review (August 2005) confirms this.

Over the years, the institute has turned out to be able to cover 30-40 % of the annual cost by grants from the national science foundation, from EC and via industry contracts. Therefore it is well equipped for such granting applications and the monitoring of the projects thereafter.

Via its orientation and its (according to mathematics standards) large size, EURANDOM is providing focus and mass. Via its workshop and visitor programs, and its hiring of young international talents, it provides a very positive stimulus for stochastics. Over 70% of the postdocs find tenured positions after their stay at EURANDOM; some of them are already full professors.

Research at EURANDOM is interdisciplinary and is organised in thematic programmes around carefully chosen topics that change on a medium-term basis. For the moment research at EURANDOM is organised in 3 programmes; the abovementioned "Queueing and Performance Analysis" is one of these programmes. The two others are "Random Spatial Structures" and "Statistical Information and Modelling".

Schematically the current programs and projects are (see www.eurandom.tue.nl for details):

1. Queueing and performance analysis (QPA)
 - Queueing theory
 - Performance analysis of production systems
 - Performance analysis of communication systems
 - Multivariate risk modelling
2. Random Spatial Structures (RSS)
 - Critical phenomena
 - Disordered systems
 - Combinatorial probability
3. Statistical information and modelling (SIM)
 - Statistics in biology
 - Statistics in industry
 - Statistical signal and image analysis

c) EURANDOM Staff

As mentioned above, EURANDOM is predominantly a postdoc institute. Junior researchers (postdocs and PhD students) stay for 2 (-3), respectively 4 years. It is very well equipped to host young researchers, especially in the framework of temporary projects. Although the institute posts advertisements in Journals in the field more or less annually around summer, there is a constant flow of applications from all over the world. This means that at any moment it is not possible to present the staff assigned to a project, but on the other hand, as soon as a project is assigned, junior researchers will easily be found. At this moment we believe we have a suitable candidate (see *cv of Viktoriya Masol*) for the proposed project.

Of course the senior staff has more permanent links with the institute. In the case of this project 3 senior scientists are essential for guidance as well as for the management of the project:

- prof. dr. Wim Schoutens, Catholic University Leuven and EURANDOM advisor (*cv included*)
- prof. dr. Jef Teugels, emeritus Catholic University Leuven and EURANDOM advisor (*cv included*)
- prof. dr. Onno Boxma, Eindhoven University of Technology and scientific director of EURANDOM, advisor of the QPA group (*cv included*).

Other senior scientists in the group:

- dr. Ivo Adan, Eindhoven University of Technology and EURANDOM advisor
- prof.dr. Michel Mandjes, University of Amsterdam, CWI and EURANDOM advisor
- prof.dr. Richard Boucherie, Twente University and EURANDOM advisor
- dr. Geert-Jan van Houtum, Eindhoven University of Technology and EURANDOM advisor
- dr. Nico Dellaert, Eindhoven University of Technology and EURANDOM

Junior researchers involved (for those working in the Multivariate Risk Modelling group cv's are included):

- Henrik Jönsson, postdoc (*cv included*)
- Viktoriya Masol, postdoc (*cv included*)
- Paul Beekhuizen, PhD student
- Josine Bruin, PhD student
- Brian Fralix, postdoc
- Bernd Heidergott, Research Fellow
- Johan van Leeuwen, Research Fellow
- Nelli Litvak, Research Fellow
- Andreas Löpker, postdoc
- Svevolod Shneer, postdoc

III. Current Research and Link with EIB Research Project

Junior and senior researchers are working currently on four topics related to credit derivatives products. We want to stress that these topics are to some extent overlapping and results obtained in one area can typically be used in another area. The supervisors at EURANDOM play a crucial role in the management of these relationships.

Single Name Derivatives

The most liquid credit risk products around are Credit Default Swaps (CDSs). These CDSs form the main input of calibration algorithms. Fast pricing algorithms under jump models have been obtained both under a firm's value setting as well as under an intensity setting.

Although quite illiquid for the moment, options on single name CDSs are attaining more attention lately. Preliminary results are obtained under a firm's value setting. However, there is a clear need to optimize the procedure, to study the pricing methods under the available battery of jump models and to come to a full implementation of pricers for the wide spectrum of products. Also the risk management of the derivatives and the quantification of the risk factors involved are part of the current research project.

Nowadays a market of LCDS has been created. LCDS have some common features with the above mentioned classical CDSs. The LCDS are very important instruments as they bring liquidity to the loan and CLO market. They permit investors to:

- a) take synthetic long and short positions for trading purposes;
- b) hedge idiosyncratic risk of an existing loan and CLO position;
- c) have an appropriate collateral portfolio to compose the iTraxx LevX index that serves as an ideal hedge instrument for the systematic risk of a portfolio of loans and CLOs.

The same that has been said in the last paragraph for the LCDS applies to ABCDS with the recently created index ABX for ABCDSs.

Index Products

Products directly related with the evolution of some popular credit risk indices (e.g. iTraxx and CDX) have seen an enormous growth the last couple of years. The dynamic evolution of index spreads calls for jump models. Equity models (with no drift) can be modified to function here in a straightforward way. Similarly the mean-reverting processes (with jumps) of the interest rate or volatility modelling can be useful to formulate alternatives. The standard FFT pricing techniques from the equity setting can be modified to very fast price swaptions (payers and receivers). These products can serve as the main input for the calibration algorithm in this setting. After a calibration procedure, pricing exotic options on the index spread (Variance Swaps, ...) can then be tackled by e.g. Monte-Carlo methods. Monte Carlo schemes under these models have been already developed for equity derivatives (see e.g. Glasserman 2003).

Recently the iTraxx LevX Senior Index was created and comprises the 35 most liquid 1st lien credit agreements traded in the European Leveraged Loan CDS market. The iTraxx LevX Subordinated Index comprises the 35 most liquid 2nd and 3rd lien credit agreements traded in the European LCDS market. It is expected that more and more positions will be taken in these indices. The modelling of the stochastic dynamics of these indices will be important for the project, since these indices contain significant information about the current market view. Traditional techniques that were used to build dynamic spread models for the above mentioned corporate credit indices can likely be adapted to build models for the iTraxx LevX indices.

Multivariate Products

The most common multivariate credit derivatives are Collateralized Debt Obligations (CDOs). Dependency (correlation) is crucial in the modelling of the underlying portfolio. The market standard is currently the one-factor Gaussian model (Gaussian copula). However, the model can not reproduce market conform prices of CDO tranches. Similar to a volatility smile in equity the market has now created the concept of (base) correlation. The reason of the failure of the Gaussian copula model, is the fact that more-heavy tailed distributions are needed to better assess the risks involved. A generic Lévy driven CDO model taking into account more flexible distributions was worked out in collaboration with Prof. H. Albrecher (T.U.Graz) (Albrecher et al. 2007). A detailed study and a comparison of the models is performed at the moment by a postdoc researcher at EURANDOM. Results are very promising, but much more work on several time-series together with a statistical evaluation needs to be carried out.

Once one can capture accurately the tranche prices and the related implied correlations, bespoke CDOs and CDO-squared (CDOs of CDOs) can be priced and managed in a more safe way.

Analogously to what has been done for the corporate CDOs will be done for the CLOs. We will adapt the current Gaussian copula models to count for prepayment features and additionally implement the more recent Lévy improvements (see Albrecher et al. 2007).

Structured Products

The Constant Proportion Portfolio Insurance (CPPI) was first introduced by Fisher Black and Robert Jones in the 1980s. The method provides a form of dynamic hedging for a portfolio and has been employed extensively in the hedge fund space. More recently, however, the credit-linked CPPI approach has become popular. The CPPI products are leveraged principal protected investments, whose return depends on the performance of an underlying credit trading strategy. This strategy has a dynamic leverage and typically for a CPPI the leverage is increased if the past performance was good and deleveraging takes place when the investments return was negative. Constant Proportion Debt Obligations (CPDOs) are similar instruments, with the difference that the leveraging is increased in case of underperformance in order to make up the losses. These products carry a significant amount of risk for the structurer (gap risk, cash-out events, ...) and are inherently very sensitive to sudden jumps on the credit spread of the underlying portfolio. Having an appropriately calibrated jump dynamics is essential for a realistic assessment of the underlying risks.

It is quite natural to expect that in the near future portfolio structured products will be composed out of a larger variety of investments products, possibly including the currently quite popular credit risk products, but also CLOs, LevX index products and other ABSs.

IV. Planned Seminars, Trainings, Workshops and Visitors programme

The host of the project EURANDOM has very well established workshop, seminar and visitors programmes. In the proposed project we are planning to organise several new seminars, workshops, training events and enhance the existing visitors programme to the EIB project.

a) Workshops

EURANDOM has an extensive workshop programme of in general 10 workshops a year, attracting around 400 speakers and participants per year. This very well developed instrument enables dissemination in a broad sense, but if needed also in a very restrictive way (workshops or sessions, for invited people only). In connection to the present application we would like to mention the following workshops:

- Mathematical Methodologies for Operational Risk, April 16-18, 2007
- Risk Measures and Risk Management for High-Frequency Data, March 6-8, 2006
- The Economics and Finance of Extremes, December 12-13, 2005
- Risk Measures and Risk Management General Aspects, May 9-11, 2005
- Exotic Option Pricing under Advanced Lévy Models, May 3-4, 2004. (Proceedings published in *Kyprianou, A.E., Schoutens, W. and Wilmott, P. (eds.) Exotic Option Pricing and Advanced Lévy Models, Wiley, 2005. ISBN 0-470-01684-1*)

The following is a tentative workshop programme within the proposed research project. From our experience we believe that organising one workshop per year is reasonable. This makes it possible to attract leading researchers both from industry and academia and to have interesting speakers.

Workshop Year 1: State-of-the-art of ABS and CLO modelling

Topics:

- Modelling ABCDSs as a credit derivative
- Prepayments, writedowns and defaults
- ABX and tranches
- CLO modelling
- the evolution and characteristics of LCDS
- Application of LCDS within a loan portfolio setting.
- Modelling of indices linked to LCDS
- Rating of CLO and ABSs
- ABS CDOs Market
- Modelling challenges in ABCDS and CLOs – using the Gaussian copula model?
- Calibration and risk measurement

Potential speakers:

- Joao Garcia (DEXIA BANK)
- Philip Schonbucher (ETH ZURICH)
- Dmitry Pugachevsky (BEAR STEARNS)
- Dilip Madan (UNIV. OF MARYLAND)
- Frederick Pfeiffer (SOCIÉTÉ GÉNÉRALE)
- David Li (BARCLAYS CAPITAL)

Workshop Year 2: Recent developments in ABS and CLO modelling

Workshop Year 3: to be determined later on

b) Seminars

At EURANDOM there exists a well established seminars programme including four seminar series, one for each research programme and one common seminar series. Each series has a new seminar at least each second week, sometimes even more frequently, where invited speakers or people from EURANDOM present current research. The seminars can have a theoretical orientation as well as a very practical orientation. To illustrate the later, we mention the Philips Lectures, which are jointly organized with Philips and the seminar series of the Multivariate Risk Modelling group.

The following industry seminars were/will be given by the people involved in the current EURANDOM project and could be repeated or enhanced.

- **Single Name CDS Modelling**, Risk Training Course London April 16th 2007 and New York May 2nd 2007 (*Advanced Techniques for Pricing and Hedging Credit Derivatives and Credit Hybrids*)
- **Comparing Gaussian Copulas with Lévy Models**, Risk Training Course London 16th April 2007 and New York May 2nd 2007 (*Advanced Techniques for Pricing and Hedging Credit Derivatives and Credit Hybrids*)
- **Lévy Processes Jumping into Credit Risk**, Correlation Trading, IPQC Conference London April 25th 2007 (Correlation Trading 2007)

- **CPPI, CPDO and Leveraged Super Senior**, Risk Training Course New York May 2nd 2007 (*Advanced Techniques for Pricing and Hedging Credit Derivatives and Credit Hybrids*)
- **Lévy versus Gaussians for CPPI's: Everything you should know and they did not say**, Risk Training (*Correlation Trading and Risk Management*) 1st June 2007
- **Lévy Processes Jumping into Credit Risk**, Quant Congress USA, New York, July 13th 2007.

Under the EIB project, regular seminars will be scheduled in the “Multivariate Risk Modelling” seminar series on the topic of “Quantitative analysis and analytical methods to price securitization deals”.

c) Trainings

People currently active in the Multivariate Risk Modelling group have experience in delivering short courses for industry people. These courses could be part of the training activities offered to EIB personnel. We could also arrange short courses inviting leading researchers in the field that could be offered to EIB personnel and researchers at EURANDOM as well as to practitioners in banks, insurance companies and so on.

Below is a short list of courses that are already developed and could serve as introductory courses for junior, senior researchers and EIB personnel. New courses could be developed on the outcome of the research projects and related topics.

COURSE 1: Introduction to Credit Risk – 2 day course

- Fundamentals
 - Components of credit risk
 - Default and survival probabilities
 - Instruments
- Modelling
 - Intensity based modelling
 - Firm's value models
 - Jump models
- Credit Derivative Pricing
 - Credit default swaps
 - Calibration
 - Pricing of payer and receiver swaptions on single name CDSs
 - Dynamic spread generators
 - Exotic option pricing on single name CDSs
- Credit Index Modelling
 - Black's model
 - Jump models
 - Pricing of payer and receiver index swaptions under advanced models
 - Calibration

COURSE 2 : Advanced Issues in Credit Risk – 2 day course

- Default dependency and Portfolio Models
 - Causes of correlation
 - Joint default probabilities
 - Conditional default probabilities
- CDO Pricing
 - Binomial model
 - One factor Li Model
 - CDO Pricing details
 - Generic jump models for CDOs

- The Gamma CDO model
 - Gaussian vs Gamma base correlation
- Multivariate Index Modelling
 - Correlated dynamic jump models for credit indices
 - Calibration on swaption market
 - Matching correlation
 - Hybrids
- Recent Advances
 - CPPIs and CPDOs under jump models
 - Assessing the gap risk under jump dynamics

d) Visitors Programme

EURANDOM has a very extensive visitor programme (on average 40 -50 visitors per year). Junior as well as senior researchers from all over the world are invited to EURANDOM. Stays can be from a few days up to several months. During their stay, visitors interact with the current group of researchers, may present their work in the seminar series and are often asked to give short courses on their speciality.

Under the framework of the EIBURS project, EURANDOM can host EIB staff members and provide them with the necessary offices and computer infrastructure. Visits can be of different nature: study visits, sabbatical leaves, short stays.

EIB personnel will have the opportunity

- to meet young researchers;
- to learn about current research performed in the different programmes;
- to present their work in an internationally oriented research institute;
- to participate in the running seminar series and workshops
- to do research in an academic and stimulating environment.

V. Budget

Tentative breakdown of the annual budget:

- one postdoc	55 k€
- guidance by senior researcher	10 k€
- workshops, training sessions and seminars, visitors	20 k€
- regular travel to EIB, Luxembourg (once a month 2 days)	5 k€
- administrative expenses and preparatory work	10 k€
 Total	 100 k€

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