

## COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

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| PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/ <i>if not in response to a program announcement/solicitation enter NSF 99-2</i>   |                  |  |   |  | FOR NSF USE ONLY        |   |
| <b>99-6</b>   |                  |  | <b>01/15/99</b>   |  | NSF PROPOSAL NUMBER     |   |
| FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) <small>(Indicate the most specific unit known, i.e. program, division, etc.)</small>  |                  |  |   |  | <b>9975116</b>          |   |
| <b>DIV OF INFORMATION &amp; INTELLIGENT SYSTEMS</b>   |                  |  |   |  |                         |   |
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| REQUESTED AMOUNT  |                  | PROPOSED DURATION (1-60 MONTHS)  |   | REQUESTED STARTING DATE  |                         | SHOW RELATED PREPROPOSAL NO., IF APPLICABLE |
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| PI/PD DEPARTMENT<br><b>Econ./Arts &amp; Sciences</b>  |                  |  | PI/PD POSTAL ADDRESS<br><b>140 Commonwealth Avenue<br/>Carney 230<br/>Chestnut Hill, MA 024673806<br/>United States</b> |  |                         |   |
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## CERTIFICATION PAGE

### Certification for Principal Investigators and Co-Principal Investigators:

I certify to the best of my knowledge that:

- (1) the statements herein (excluding scientific hypotheses and scientific opinions) are true and complete, and
- (2) the text and graphics herein as well as any accompanying publications or other documents, unless otherwise indicated, are the original work of the signatories or individuals working under their supervision. I agree to accept responsibility for the scientific conduct of the project and to provide the required progress reports if an award is made as a result of this application.

I understand that the willful provision of false information or concealing a material fact in this proposal or any other communication submitted to NSF is a criminal offense (U.S.Code, Title 18, Section 1001).

| Name (Typed)                       | Signature | Social Security No.*  | Date |
|------------------------------------|-----------|---|------|
| PI/PI<br><b>Christopher F Baum</b> |           | *ON FASTLANE SUBMISSIONS*<br>SSNs are confidential<br>and are not displayed |      |
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### Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding Federal debt status, debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 99-2. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflict which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

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#### Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

#### Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

|   |   |                                   |
|---|---|-----------------------------------|
| AUTHORIZED ORGANIZATIONAL REPRESENTATIVE      | SIGNATURE   | DATE                              |
| NAME/TITLE (TYPED)<br><b>Stephen Erickson</b> |   | <b>01/13/99</b>                   |
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\*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

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# Project Summary

EDEL: Economics Distributed Electronic Library

January 1999

The EDEL project proposes to extend and strengthen RePEc: an existing collection of metadata about ongoing research in academic economics. These metadata currently describe researchers' working papers, or preprints, and are decentralized into a number of archives worldwide, many of which provide free downloads of the papers themselves. Free access to these metadata via the Internet is provided by RePEc (Research Papers in Economics) "services", which use sophisticated software to create a single virtual collection of metadata, automatically updated daily to incorporate additions to each archive.

Extensions of this project are proposed to incorporate personal information into the metadata, as well as information covering datasets and software components that researchers are willing to share with their colleagues. An extended RePEc would provide a "digital collaboratory" for researchers worldwide to exchange their research findings, their contact coordinates, and their essential research tools: datasets and software components. Another dimension along which RePEc would be extended is that of online peer reviews of working papers, providing those searching for the latest research findings with their peers' opinions of particular papers' merit.

The proposed research would lead to the development of standards for the description of persons, datasets, and software tools which would then be implemented as extensions to the existing RePEc software tools. RePEc user services would be extended to incorporate these metadata. A limited amount of content creation would provide a "proof of concept" for each of these extensions, and provide a basis for the widespread adoption of an extended RePEc by academic economists, research institutes, and government agencies. All standards and software used would be published in order to form a body of work which would serve as a foundation for efforts in other academic disciplines. EDEL would be a testbed for the construction of freely accessible academic metadata systems.

The emphasis in each of these extensions to RePEc is placed upon the creation of a robust, sustainable system which operates through the contributions of many participants worldwide. The RePEc concept depends in a very limited fashion upon centralized resources, and to the greatest degree possible upon distributed information, where each provider is only responsible for the maintenance of her archive. The software used in the system is platform-independent and freely available, and the creation of new user services—to provide access to the metadata in a different format—is explicitly encouraged, as long as those services are available without charge. This model, incorporating the volunteer efforts of many researchers worldwide to leverage modest prior funding, has worked well, and with funding of the EDEL project initiatives, its full potential would be realized. The provision of an expanded and strengthened RePEc would make economic research findings, tools, and contact information available to all, in the process strengthening economic education and enhancing human resource development in the developing world.

# EDEL: Economics Distributed Electronic Library

Christopher F. Baum and Thomas Krichel

January 1999

## 1 Introduction

This application is submitted to the National Science Foundation and the Joint Information Systems Committee, as a response to Announcement Number NSF 99-6 and to JISC Circular 98/15, respectively. It is jointly published on the WWW at <http://netec.wustl.edu/AcMeS/edel.html> in the United States, and at <http://netec.mcc.ac.uk/AcMeS/edel.html> in the United Kingdom. The joint authors of the proposal are Christopher F. Baum, associate professor in the Department of Economics at Boston College, and Thomas Krichel, lecturer in the Department of Economics at the University of Surrey, and Director of the Surrey Library Lab.

The funding sought will be used to extend and strengthen the RePEc project in order to transform its scope to that of a Distributed Electronic Library for the discipline of economics. RePEc is a decentralized collection of metadata about ongoing research in academic economics that provides World Wide Web access to researchers' latest efforts, well prior to their eventual publication. These metadata are produced by academics for academics; since academic economists do not usually conduct metadata collection, RePEc relies on two principles to lighten the burden of effort and obviate the need for staff dedicated to maintenance of the metadata. First, the decentralization of RePEc's archival materials implies that the collaboration of many academics and many support staff in university departments and research institutions allows the workload to be spread widely, and minimized for each collaborator. Second, a heavy reliance on intelligent technology transforms bibliographic information produced at a wide number of sites ("RePEc archives") into a single, searchable, virtual collection of metadata, automatically performing the syntactical analysis, merging, indexing, and validation needed to update the collection on a daily basis. The overall effort has worked well for the core of RePEc's original mission: the collection and dissemination of information about academic literature to the worldwide economics community.

This proposal seeks to develop logical extensions to the original RePEc concept along three lines:

1. the incorporation of metadata uniquely identifying and locating researchers themselves;
2. the extension of metadata to shared archives of datasets and software tools of interest to economists; and
3. the establishment of peer review services for the literature accessible through RePEc.

Each of these extensions are technically quite straightforward; the technical challenges are to a greater degree a function of the user interface design. There are many design issues to be addressed in order that such metadata may be maintained easily and reliably. The fundamental thrust of this proposal is oriented toward the appropriate design of "digital laboratories" in which researchers' contact information, their research papers, their contributed software, and the datasets they wish

to share—as well as peer-provided reviews of their work—would be reliably accessible through the Web. That design involves the establishment of appropriate data structures, on the one hand, and implementation tools on the other that can be freely shared with the maintainers of RePEc archives worldwide, working with a variety of hardware and software platforms. The proposal would fund a limited amount of content creation in order to provide sufficient metadata in each of the three areas of focus to serve as a clear “proof of concept”. The existence of this proof of concept would stimulate two forms of activity: the extension of current RePEc archives in each of these three areas, and further stimulus to those content providers who are not RePEc archive maintainers to consider the benefits of collaboration. The success of this strategy has already been established: RePEc has grown from a handful of original archives, encompassing none of the major institutions that participate today, to its current strength largely by demonstrating that the RePEc principles work admirably well. This proposal seeks to build upon that success.

The remainder of this application is organized as follows. In Section 2 we will introduce the RePEc data system and the NetEc user services. In the next three sections we discuss the extension of RePEc to personal data, statistical datasets and software components, respectively. In Section 6 we outline the plans for online peer reviews. Section 7 presents our proposals for the management structure. In Section 8 we outline the milestones for the project. Section 9 surveys related efforts. The ultimate section concludes the application.

## 2 The RePEc system and the NetEc project

RePEc is a decentralized collection of fielded *attribute:value* bibliographic data relating to research in the discipline of economics. At the time of writing, these metadata mainly refer to working papers, i.e., to accounts of recent research results prior to formal publication. These bibliographic data are held on digital data archives based on public access computer systems. RePEc has been adopted by major providers of research materials. These include the National Bureau of Economic Research (NBER) and the Federal Reserve System in the US, the Centre for Economic Policy Research (CEPR) and the Bank of England in the UK, and a number of European sites. They view RePEc as an important tool for the dissemination of information about their publishing programs. There are also some smaller departments represented among the RePEc archives. We think that RePEc is particularly valuable for small departments, because it gives their work an exposure that would be very difficult to achieve otherwise.

The metadata in the RePEc archive generally describe electronic or printed documents. In early 1999, there are around 60 archives, which provide over 11,000 electronic research documents as well as bibliographic data for an additional 50,000 printed documents. Since the participating archives update the data themselves, the collection is sustainable without external funding. The total cost of the collection is sufficiently well spread as to ensure that it can be absorbed within each institution. There is only a small amount of work that needs to be conducted on a central site. It stores information about all existing archives, i.e., data about where the archive can be found on the WWW, who provides the archive, and what series of documents are provided.

The data held in the RePEc archive are simple ASCII templates following a format called “ReDIF”. The end user does not access the data in that form. RePEc relies on outside contributors to use the data for user services. User services usually operate on computer systems that maintain regularly updated copies of remote RePEc archives. This process is known as “mirroring” in the internet jargon. The central archive provides free mirroring software that make this process technically quite straightforward. The RePEc data are therefore readily available for any third party who wishes to implement and offer new user services, as long as they do not charge for those services or incorporate

the data in a commercial product. The central archive also provides free software to read and validate the ReDIF templates.

Shortly after the foundation of RePEc in May 1997, several user services appeared. IDEAS is a set of web pages for all documents and software components in the RePEc dataset, updated daily and searchable with eXcite. NEP: New Economics Papers is a current awareness service to be described in Section 6. The DECOMATE Working Papers & Research Memoranda provide a Z39.50 service.

The oldest user services using RePEc data are BibEc and WoPEc. They offer web sites with static pages of the printed papers and electronic papers contained in RePEc respectively.<sup>1</sup> BibEc and WoPEc offer a WAIS full text index, ROADS whois++ servers and an mSQL database. Both projects were founding fathers of RePEc. They still contribute to RePEc by running RePEc archives, and they use the data that is provided by other archives.

BibEc and WoPEc are parts of NetEc. NetEc, founded by Thomas Krichel in 1993, is a collection of free services for academic economists, offered simultaneously on sites in the United States, the United Kingdom, and Japan. These NetEc web sites are already well established and widely used. Any effort made under this proposal that requires direct contact with economists will use the NetEc sites. Work conducted under this proposal will either enhance existing NetEc projects or create new ones. There are two NetEc projects that will be enhanced by work in this application.

First, there is the HoPEc collection of economists' homepages with publications, classified according to the JEL classification of their research area. There are currently over 300 researchers registered. Under this proposal, HoPEc data will be included into RePEc and the HoPEc service will be generalized to all homepages, with an emphasis on self-registration. The HoPEc service will thus expand in scale and in scope. But it is important to note that the applicants have experience with a system of personal information since January 1997.

Second, there is the CodEc collection of computing code for economists. This project is not yet integrated in RePEc in the sense that it contributes a RePEc archive and uses RePEc data. The dataset that it holds is rather small at the moment, but it still enjoys a healthy usage within the community. An article about CodEc was published in the journal *Computational Economics*. Efforts made under this proposal, as described in Section 5, will be a successor to CodEc. They will integrate the existing CodEc collection with the existing RePEc software archives (e.g. Christopher Baum's Boston College Statistical Software Components Archive) and take over the user base that these services have developed.

Finally we will create a new NetEc service, DatEc, that will contain the dataset information, as described below in Section 4.

### 3 Personal information

Increasingly, academics working in a particular field form a virtual international community. As the costs of telecommunications and international travel decrease and the specialization of research areas increases, it is increasingly important to know who is working in one's area of interest and how to contact them. This primary need will be addressed by the extension of RePEc to incorporate personal information. Within the overall RePEc project, the inclusion of personal information is a crucial feature to complete the description of economic researchers as a relational database, and create unique identifiers for RePEc authors so as to normalize that database. It represents an

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<sup>1</sup>The division into electronic papers (WoPEc) and printed papers (BibEc) has historical reasons: when these sites were founded, the number of electronic papers was tiny and none would have been found in most searches on the combined dataset.

important technical innovation over current electronic library systems. We are not aware of any library system that uniquely identifies and locates its authors—an increasingly important service when much of researchers' current work is potentially available on line. When the bibliographic record can readily be resolved into a person's current (rather than historic) contact details, it will be much superior to conventional systems.

The usefulness of a global registry for economists goes far beyond the Distributed Electronic Library system that it will underpin. For example, such a system would be of considerable value in the organizing of scientific conferences. To a greater and greater degree, online conference programs provide links to both the participants' email addresses and homepages, to the abstracts of papers presented at the conference, and to downloadable copies of their full papers. For example, the RePEc system has been used in this regard to create an archive of papers presented at successive meetings of the Society for Computational Economics. However, the personal data for each participant must be laboriously collected and reinput for each event. With a personal information system providing full and up-to-date contact information for many participants, the conference organizers would be readily able to produce these materials by merely referring to the individuals' personal information "handles". In this sense, the project would develop the equivalent of an electronic "business card" for those economists who participate.

Another potential group of clients for such a system includes scholarly societies. At present, each scholarly society has to collect the same information about its members, and since most economists are members of several societies, there is a considerable duplication of effort. One aim of the proposal is to work with societies so that they share their data about their members. Thus in a first stage, information about the persons will be gathered through intermediate collections such as the rosters of scholarly societies, research institutes, and academic departments. It will simultaneously be conducted through a centralized archive in which researchers may register themselves. The information supplied by the researcher herself will be the information we trust most. Through a centralized web-based system, they will be able to redirect the data supplied by the scholarly societies to the data they supply themselves. To find out how such a system of local *and* central registration can work is one of the major research aims of the proposal.

Another research question is the harmonization of author information in the document templates with the personal data that have been collected separately. Of course in the longer run, providers of small archives can work much more efficiently when the authors are identified, since any change of author information will be made only at one place. In the short run, archives will need assistance to switch to a metadata model in which the personal information is separated from the document information. The task of linking document information to personal information will also be conducted at the level of RePEc services. Code that will make educated guesses about which is the correct handle will be produced by the project and distributed to service providers.

To summarize, the efforts that will be conducted in this area include:

- set up a general framework for collection and deployment of personal data
- build an extension of the HoPEc web site for the registration of persons
- advertise that site for the collection of data
- work with scholarly societies and academic departments for the collection of personal data
- extend existing control and rendering software to include personal data
- extend the existing SQL database of RePEc data to support personal information as a separate data structure



## 4 Dataset information

Paradoxically, the sharing of freely available datasets has perhaps become more challenging with the advent of the Internet. Reference librarians are well aware of the frustrations involved with the patron who states “I know that these data are available on the Internet. Can you please find them for me?” In the past, the patron would have been told that a tape must be purchased, and technical personnel mustered to deal with its contents. Today, many of those datasets are Internet-accessible, but to be useful resources, researchers must be able to locate them and determine whether they may suit their needs. Innumerable datasets are available on the Internet, in a myriad of proprietary formats. A researcher might be searching for cross-country annual data on particular statistical measures over a given time period. How might current metadata technology most readily provide access to the information needed to locate these data, determine whether they are available in a usable format, and if so download them?

To rationalize development of a Distributed Electronic Library in the form of RePEc metadata and services for economic datasets, we must step back and consider the naissance of RePEc itself. The worldwide metadata archive that we call RePEc was constructed to deal with the difficulties that a sizable number of separate working paper archives was beginning to create. In the absence of a “union catalog”, a researcher would be faced with a list of dozens of separate archives, any of which might contain papers of interest. This same difficulty is likely to befall the researcher searching for datasets today. There are many excellent sources of downloadable data on the Internet, and a number of particular web pages assisting researchers seeking to locate data in certain areas; but even in a narrow field, the researcher must trudge from one to the next, and after identifying one potential source of data, may lack any way of comparing this site with other available, possibly overlapping collections.

We must also consider that far more data are Internet-accessible than are usable in practical terms. Many researchers have experienced great frustration in terms of the time and effort required to generate usable data, in the format amenable to the statistical tools they use, from the raw data made available by government agencies, industry groups, or sponsored research projects. There are many efforts currently extant in which research groups provide access to the cleaned, checked and formatted versions of raw data via the Internet. In most cases, researchers seeking these data would prefer to make use of these datasets rather than the original datasets. A metadata archive can provide the necessary information to facilitate researchers’ choices—in essence, providing a catalog of the various forms in which a dataset may be freely available via the Internet. This effort would be independent of any of the agencies providing access to datasets—but just as a considerable volume of RePEc’s bibliographic information is contributed by “publishers” such as NBER and CEPR, data “publishers” would be encouraged to contribute bibliographic information on datasets that they maintain.

We propose to develop a system for metadata collection and presentation which would entail development of metadata links to individual datasets, assisting researchers to locate datasets of interest by keyword scans of datasets’ coverage, contents, and format, and locate an appropriate source from which those data may be obtained. These metadata would build upon the flexible and extensible *attribute:value* ReDIF format of RePEc to provide a search capability for a number of characteristics of an archived dataset. These would include, e.g., the organization of the data (cross-sectional, time-series, pooled, or longitudinal); the nature of the observation unit (individual, household, establishment, good, firm, industry, nation, etc.); the frequency of measurement for time-series data; the original source of the data; the number of data records, in terms of their organization; the format of the data, in terms of required software to access it; etc. These are salient features of the dataset which may be categorically defined. They would be accompanied by an “abstract”,

similar to that used by existing dataset libraries such as the Inter-University Consortium for Political and Social Research (ICPSR), to describe the general nature of the data, and its relation to other datasets. The abstract could also identify a dataset as having been derived or constructed from other datasets in the collection. An open-ended list of keywords (as presently used by the ReDIF syntax) would be used to specify the major categories of measurements, or “variables”, in the data; a researcher using a search engine such as eXcite on the IDEAS server would then be able to locate all datasets containing certain measurements, and identify which might meet her needs. Although the specific details of the metadata design will be determined in the course of the research, this description should indicate the potential of such a system to provide researchers with a single point of access to a wide variety of dataset information.

Just as with the development of RePEc, we would expect that as the use of metadata on datasets gains credence among researchers, more and more data providers would choose to incorporate their holdings in the system. As RePEc’s utility for disseminating information on working papers became evident, major providers of research papers such as NBER, CEPR, the Federal Reserve System and the Bank of England joined the effort. We would expect that a well-designed metadata archive of available datasets would gain acceptance in the same manner. One of the very attractive features of the ReDIF syntax is its ability to incorporate templates containing the bare minimum of required fields, as well as those which more fully describe the holdings. Given this design, a dataset provider may readily generate minimal templates for each dataset, and over time work to more fully elaborate the metadata. The effort required for a dataset provider to generate a minimal template for a dataset would be minor, but its inclusion in a worldwide archive of economic data would greatly enhance its sharing among researchers. Indeed, some data providers might want to make use of the system as their primary delivery tool, as it would provide a well-formatted, Web-accessible interface to the data on their FTP site at very low cost. This would encourage individual researchers, research institutes, and even commercial providers who are willing to make a subset of their data freely available to participate in the effort.

To distribute the dataset collection to end users, we will open a new NetEc service “DatEc” on the NetEc sites. Since these sites are already well known to many economists, the efforts will immediately be well disseminated. For a limited number of datasets that are of general interest and in the public domain—for example, the Penn World Tables—we will build a computing environment that uses Java-based tools to provide online statistical computations, building on the pioneering Java-implemented WebStat that has these capabilities. With such an application linked to widely-used datasets—such as the tables of macroeconomic data available in the U.S. *Economic Report of the President*—a user could access DatEc and use the data from a limited number of datasets directly within her web browser. We are confident that this will be an excellent teaching tool. It will also go a long way toward bringing economic data to life, for the student of the subject as well as for a member of the general public with interest in economics.

To summarize, this section of the proposal would provide

- a set of guidelines for the description of statistical datasets in a form simple enough that it could be maintained by the producers of the datasets
- a collection of metadata about datasets that acts as a critical mass for the collection and that validates the guidelines that we have set out
- a service where users can search for datasets by their characteristics and contents type
- give advice to and participate with other groups seeking to develop metadata standards, such as the Dublin Core initiative

- build a testbed for the online extraction and delivery of data using Java-based statistical packages.

## 5 Software information

In the prior section, we have described the great benefits that would be provided by the development of a Distributed Electronic Library for datasets used in economic research. Much empirical research in economics of necessity goes beyond the capabilities of “off-the-shelf” software applications, in the sense that modern econometric analysis often involves use of recently-developed or elaborated empirical techniques which may not be built in to any of the common statistical packages or econometric languages. This rapid technological change, corresponding to the high degree of innovation in econometric theory and methods, may be traced to the massive reductions in cost of computing, and the widespread availability of processors with memory and storage capacity unthinkable a decade ago.

Nevertheless, the rapid pace of change—with new software tools being developed to take advantage of the increases in computational capability—brings its own frustrations to the empirical researcher striving to make use of the most appropriate technology for her research project. Since she may customarily conduct her statistical or econometric analysis in package *X* (or language *X*: we use the terms interchangeably), she needs to know whether someone has already solved a difficult computational problem using that package, and if so, where the software is to be found. Mailing lists and newsgroups—whether organized by vendor or user community—are helpful to researchers, but the posted message “I think Prof. Jane Doe at University of Hagen said that she had software to do that...” is rather frustrating. Section 3 of this proposal illustrates how appropriate technology could at least help locate the current whereabouts of Prof. Jane Doe-Wilkins, née Doe, and provide her contact information. This section of the proposal speaks to the more pertinent underlying question: if software components have been made freely available to the economics community, how may researchers’ access to those components be enhanced by the provision of a single point of contact?

Thus, we propose to develop a system for metadata collection and presentation which would focus on the extensibility of modern software tools: statistical packages and econometric languages. To a greater and greater degree, software used in economic research are high-level computer languages, or statistical packages with embedded formal programming languages. These tools encourage replicability and extensibility—that is, rather than writing a wholly purpose-built program to perform data reduction or econometric analysis, researchers are encouraged to write reusable software modules that perform components of those tasks, and assemble them to deal with the task at hand. This is most notably true in the field of object-oriented programming—some elements of which have become popular in economic analysis—but has also been the focus of procedural and functional programming in languages such as Mathematica, MATLAB, Ox, and GAUSS, and sophisticated statistical packages such as Stata, SAS, and RATS. This paradigm shift in the use of computing in economic analysis, coupled with the increasing likelihood that researchers will be responsible for much of their own programming, has led to the development of a virtual community of researchers with interests in computing in economics. This community has developed many mailing lists, discussion groups, and professional societies such as the Society for Computational Economics.

The next logical step is the formulation of a standard mechanism by which researchers may place their freely available software components in the public domain—in the spirit of the GNU/Linux movement—via a system that will provide ready access to the “bibliographic information” describing those software components, and facilitating their acquisition. The RePEc model for the exchange of information about scientific literature may be adapted to work equally well for the dissemination of

information about software components.

A pilot project to implement the first steps of a Distributed Electronic Library for economic software information was initiated in September 1997 by Christopher F. Baum. In cooperation with Thomas Krichel and Christian Zimmermann (manager of the IDEAS RePEc service), Baum proposed a modification of the ReDIF Article template to permit the handling of “software components”: elements of software in any of the commonly-used econometric languages that are freely available to researchers. Contributions to this archive, the Boston College Statistical Software Components Archive, have been integrated into RePEc, and those searching IDEAS may search among working papers, published articles, and/or software components with ease. The archive has been quite successful, with over 225 components currently available.

Despite this success, we can clearly identify work that must be done to permit this concept to scale to 1,000 or 2,500 components. The current template design contains keyword elements (similar to the keywords associated with working papers or published articles). One item to be developed is a consistent set of keywords—borrowing, perhaps, from that already in use for the categorization of statistics—and the generation of keyword-search facilities.<sup>2</sup> Additional development is also required to deal with large-scale contributions to the archive. The current system works quite well for small, single-purpose elements: e.g. code that computes a single test statistic or generates a particular transformation. Some archived materials, however, are libraries of procedures which may add a broad set of capabilities to a given econometric language. It would be inefficient to “catalog” each component of these libraries, but entering such a library as a single component inadequately references its contents. We would strive to develop standards for the handling of such materials—borrowing from the standards developed in library science to catalog collected works—to ensure that those searching a Distributed Electronic Library of software components would have ready access to the materials’ capabilities. We would endeavor to develop cooperative partnerships with the major vendors of statistical software and econometric languages, seeking their permission to integrate their proprietary holdings of public-domain software developed for their package into such a library. We would expect that the vendors would be enthused about such participation, since it would only serve to provide a broader audience for their products’ capabilities.

In summary, this section of the proposal attempts to deal creatively with a field in very rapid flux: the accessibility of software tools for empirical research. We propose these deliverables:

- a set of guidelines for the description of software components in a form simple enough that it could be maintained by the authors of the components
- a collection of expanded metadata about software components that acts as a critical mass for the collection and that validates the guidelines that we have set out
- a service where users can search for software components by their capabilities, language and keywords
- partnerships with the major vendors of statistical software and econometric languages, encouraging their participation in this effort.

## 6 Online peer review

Peer review is at the center of scientific publication. The way it currently operates is weak, crude, harmful to dissemination, divisive and time-consuming. It is weak because there are no incentives

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<sup>2</sup>The current search in IDEAS accesses author, title, “abstract”, and keywords indiscriminately; for some purposes, a keyword-only search would be more appropriate.

offered to reviewers to do a thorough job. It is crude because it makes only one binary type of decision: publish in an academic journal, or not publish. It is harmful to dissemination because once the paper is published, the publisher enacts restrictions on its circulation. It is divisive because authors are separated from reviewers rather than working with reviewers to improve their paper. It is time-consuming because authors can only submit to one journal at a time and reviewers have no incentive to act promptly.

The most important concern regarding to scientific publication within the library community has been the cost of purchasing scientific output. The library community increasingly realizes that the problem cannot be solved without changing the way in which the academic world operates. This idea is given prominence in Association of Research Libraries (1997). Despite the well-known problems that the scholarly communications system has developed over the past two decades there have been very few initiatives coming from *academics* (versus publishers) to change the existing system. The main reason is that the organization of academic circles is implicitly hierarchical. At the top level, the well known professors hold editorial positions with the best and oldest established journals, and gain considerable prestige and influence from these positions. Any change in the system will put these privileges at risk. On the lower level, younger academics will not seek to publish in new and alternative media unless these have the respect of their senior colleagues. New formal scholarly publication channels will find acceptance slowly at best, in particular if they are led by individuals or institutions that have not been active in that field and/or if they involve technical innovations.

Therefore we start with the premise that the current scholarly publication system cannot be reformed. The system that we are proposing here is not meant to replace peer review in the published journals. However we hope to develop and test a different form of peer review to be employed in parallel to the existing system. Since our system will be decentralized, it could be successfully implemented through the participation of many academics. We must ensure that there are clear incentives for academics to participate. The most important feature of our plans is a generic evolution, where each step follows from the previous step, and where each new step is starting on a small scale to carefully investigate the validity of our approach. Over time, if our system gains widespread use, the importance of peer review in the old style will vanish. Only the most influential current journals would survive.

At the time of writing this application, we help to operate NEP: New Economics Papers, a primitive peer reviewing system. Each week a robot gathers all new additions to the RePEc metadata for the past week, and sends out information about these items to a group of editors. Each editor is responsible for a subject field, such as "Time Series Econometrics" or "Microeconomic Theory". Each email is formatted as a report of new additions to RePEc in a specific subject area, but each contains all recent additions to RePEc. The editors then cut the contents of the report down, retaining only those entries that they judge as relevant to their subject area. The report is then sent to an email mailing list to which all economists are invited to subscribe without charge.

NEP was founded in April 1998 by Thomas Krichel and is now coordinated by John S. Irons of the Department of Economics of the Massachusetts Institute of Technology. He works as a volunteer as do the report editors. On 1 January 1999, NEP counted 30 lists maintained by 19 editors, most of whom are PhD students or young postdoctoral researchers. They have good incentives to maintain a well edited list. First, they need to become and stay acquainted with the literature in their field. Second, as a report editor, their name becomes more widely known. The rapid growth of the number of NEP lists is an indication that the incentive structure is right, in that it is possible to find people to do that job on a volunteer basis. Data on NEP usage suggests that there are already about 1200 individuals subscribed to the NEP lists, so that there is clear scope for the growth of the readership.

NEP is not the only primitive peer review system within the discipline. William L. Goffe's

“Resources for Economists on the Internet” lists a number of single subject sites that list resources for specific subjects within Economics. These sites review quality resources on the web. Many of these resources are rather general; they may be items that a researcher has found to be useful to her work, or links to homepages of other individual researchers working in a certain field.

The peer review systems that we propose sets out to combine the single subject sites with the NEP system. Each site will propose to survey recent papers about a certain subject area. Each survey site is headed by an editorial team of at least three people. Each paper will be graded to give the reader of the site a broad idea about the quality of the paper. One of the research objectives of the proposal will be the development of an appropriate grading system for papers. This is unlikely to be close to a marking scheme like “A”, “B”, etc., but will evaluate the amount of new material, the extensibility of the paper, the documentation supplied (if there are datasets clearly referenced, if the calculations are properly documented, etc.). The editors will either read the papers themselves or coordinate a team of reviewers. Reviews will classify the paper and describe its contents in a few lines of text.

We expect that each editor will use XML tags to produce the survey web site, or “SurWeb site”. The funding will be used to develop a set of common tags that can be uniformly applied on each site (without implying that each site will have exactly the same look) and on building robot software that will gather the peer review data and integrate it with the rest of the RePEc data. Thus a user who locates a paper in a RePEc database service would immediately see that the paper has been reviewed. The exposure of reviewing sites through the RePEc database services will be one of the main mechanisms by which the peer review system will disseminate. Good dissemination implies that SurWeb editors have strong incentives to produce good sites.

Although the SurWeb system will be free at the point of use, that will not be its main advantage. We aim to improve on the existing peer review system, not compete on a cost base. We are aiming for a system that emphasizes currency, concurrency and one that scales and disseminates well. It should be a current system that cuts through the publication delay by offering access to the very latest research. This is an important advantage because nowadays the formal publication delay in economics is estimated to be about four years. The SurWeb system will be concurrent because the submission of a paper to one SurWeb site will not in no way limit its submission to another outlet, be it another SurWeb site or a conventional journal. Several outlets will judge a paper and there may be divergence of opinion. Finally we wish to build a system that scales and disseminates well. Any review or opinion on the paper will enter the RePEc metadata collection. Any user system built on that dataset can then use the data. RePEc already represents a critical mass of bibliographic information and the number of RePEc users represent an important dissemination opportunity.

The applicants are in a unique position to realize such a system. In 2001, when the system is to become operational, they will have eight years of experience of publishing electronic papers, and the RePEc system will have enjoyed the reputation of a standard feature of professional communication. The NEP system will have grown and be an ideal recruitment ground for SurWeb editors.

The deliverables of this section of the proposal include:

- a set of guidelines for online review
- a set of XML tags that implement the SurWeb system
- robot software to gather review results for integration with RePEc database services.

## 7 Management structure

Christopher F. Baum and Thomas Krichel will be joint project directors, responsible for the delivery of project objectives. In the United States, Christopher F. Baum will devote a sizable fraction of his research time throughout the calendar year to management of the project. In the United Kingdom, the rôle of project manager will be initially filled by Thomas Krichel but a separate project manager may be hired. The US side will be primarily responsible for the deliverables in Section 4 and Section 5 and the UK side will be primarily responsible for the deliverables in Section 3. Both sides will be working jointly on the deliverables in Section 6.

A steering committee will be established to oversee the work. It will comprise the project directors, three persons from the US, and three persons from the UK. Of the three, one will be from the library or research support community, one will be from the economics community and one person will be a representative of the funding agencies. The committee will not meet face-to-face, but will convene via an email list based at mailbase instead. The project director in each country will travel once each year to the other country, and during their stay they will meet the members of the steering committee in the other country.

The project directors will report to the steering committee on the progress of the work on a monthly basis. They will consult the steering committee on all important matters regarding the project. The project directors will seek the authorization of the steering committee for any expenditure exceeding £1000 or \$1500. They will also seek the approval of the committee on all staffing decisions.

## 8 Milestones

The proposal is for funding over three years. The first two years will be spent on the building of the personal information, dataset information, and software information services that we have outlined above. The last year will be spent on building online peer reviewing systems. However some of the preparatory work for those systems will be done during the second year.

### 8.1 Personal information service (HoPEc)

Within three months of project initiation, we will publish a set of requirements for the central personal information service and compile a list of intermediate collectors who could provide and use personal information. A fully operational personal information service will be provided within nine months. This will use the researchers classified in HoPEc as an initial set, and will allow those researchers to register themselves. From months 9 through 12, we will work with academic departments and scholarly organizations to make their data accessible on the central system HoPEc. In the second year, we will also open the HoPEc system to scholars to provide their own identifying information, and edit (using verified identity) their personal data provided by other sources.

months

- 1-3 publish a set of requirements for the central personal information service and compile a list of intermediate collectors who could provide and use personal information
- 6-9 build central system for personal registration
- 9-12 integrate personal data from academic departments and scholarly organizations
- 12-24 develop and publicize individual interface to personal information

## 8.2 Dataset information service (DatEc)

Within three months of project initiation, we will publish a set of requirements for the central dataset information service and compile a list of intermediate collectors who could provide and use dataset information. A fully operational dataset information service will be provided within 12 months. From months 12 through 24, we will work with academic departments and scholarly organizations to make their data accessible on the central system DatEc. In the third year, we will also open the DatEc system to scholars and research institutes to provide their own dataset information.

months

- 1-3 publish a set of requirements for the central dataset information service and compile a list of intermediate collectors who could provide and use dataset information
- 3-12 build central system for dataset information
- 12-24 integrate dataset information from academic departments and research institutions
- 25-36 develop and publicize individual interface to dataset information

## 8.3 Software information service (CodEc)

Within three months of project initiation, we will publish a set of requirements for the central software information service and compile a list of intermediate collectors who could provide and use software information. A fully operational software information service will be provided within 12 months. From months 12 through 24, we will work with research institutions and software providers to make their software accessible on the central system CodEc. In the third year, we will also open the CodEc system to scholars and research institutes to provide their own software information.

months

- 1-3 publish a set of requirements for the central software information service and compile a list of intermediate collectors who could provide and use software information
- 3-12 build central system for software information
- 12-24 integrate software information from research institutions and software providers
- 25-36 develop and publicize individual interface to software information

## 8.4 Peer review services

Let us first recall that the peer-review effort will start later, because we need more time for XML to be deployed and understood, and more time to observe the NEP and single subject site efforts. We will start with a consultation exercise in month 21 among the people we think would be interested in leading a subject site. With their cooperation, we will write a discussion document that will set out our broad plan. Once we have reached a consensus among the inner circle on a private work program and a public manifesto, we will seek general consultation and publish the manifesto as widely as possible. There will be a lot that we will have learned after these two steps, and we will make every effort to document the steps we took, because these services will lead the discipline from the journal culture into a culture yet to be defined.

months

- 21-24 consultation with inner circle leading to a draft protocol and a manifesto
- 24-27 wide circulation of manifesto
- 30-36 implementation of SurWeb sites
- 35-36 report



## 9 Related developments

In this section, we wish to review two related developments that are important for our work. These are the xxx Preprint Archive and the Dublin Core Metadata Initiative. We shall take these issues in turn.

The xxx Preprint Archive is a centralized archive that provides preprint services for a range of disciplines. Its initial stronghold is High Energy Physics, but it has spread to other areas of Physics, Mathematics and recently opened an archive for Computer Science. The archive is centralized in the sense that all papers in the discipline are stored on-site, and that site is then mirrored into several countries for better access speed to local users. This centralized approach has been utilized in Economics since 1993 by the Economics Working Paper Archive. However, it has demonstrably failed to make an impact, in the sense that it has never held more than one third of the total stock of electronic working papers. In recent years, the share of its holdings in the total online stock has fallen continuously. Its holdings are presently included in RePEc.

A later attempt to offer a central archive on a commercial basis is the Economics Research Network accessible at <http://www.ssrn.com>. This service does extensive collection efforts that are initially heavily subsidized. We estimate that they held 2,000 papers at the end of 1998. They have expressed interest in integrating their holdings into RePEc, but most of the papers they link to are already in RePEc through other channels. Inclusion of a paper into their archive is free to the author, but their current awareness lists—similar in concept to the NEP lists described above—are available only by subscription after a free trial period. Some authors have resisted participating in this service due to its commercial nature, objecting to the charges levied on subscribers of the current awareness lists.

There could be several reasons why the centralized approach of xxx has failed in economics, but we do not think that the reasons are relevant for this application. However, one thing that is certain is that the use of centralized archives is not the only way forward for the exchange of preprints using today's technology. There are communities where a decentralized model is required. Just as the centralized model is spreading in the natural sciences, the RePEc project could spread to other social sciences. We expect that to happen during the lifetime of this project, but we cannot make this a deliverable for this application because it depends on the collaboration of other groups.

One other discipline that has had a decentralized organization of its preprints is computer science, through the Dienst software that underlies the NCSTRL collection, albeit with a quite different structure: Dienst is implemented through server software that provides repository, index and user interface function is one piece of software. This is efficient, but has the drawback that this software must be installed and maintained by all institutions that participate in NCSTRL. According to Jim Davis, the principal architect of the Dienst software, "The difficulty of installing the software is one of the major barriers to participation in NCSTRL." (private communication of 23 October 1998). If this is a problem in computer science, it will be even more so in economics where the degree of computer literacy is much lower. Therefore we have favored a metadata-driven solution, in which only the data and the metadata are provided by the participating institution, and where external servers handle and integrate the metadata.

An important recent effort of devising a general metadata scheme is the Dublin Core Initiative. On its homepage at <http://www.purl.org/dc>, we read

The Dublin Core is a metadata element set intended to facilitate discovery of electronic resources. Originally conceived for author-generated description of Web resources, it has attracted the attention of formal resource description communities such as museums, libraries, government agencies, and commercial organizations.

Between 1995 and 1998 the initiative has developed a list of 15 basic data elements that are important for resource discovery and description. There were recent calls to reduce the number to 13. These data elements can be further qualified, but there is no standard for either the qualifier semantics or the qualifier syntax. The major reason for the slow progress of the initiative is the magnitude of the task. It is very difficult to find a set of metatasks that could be applied on wide variety of digital and physical objects. This is well explained by Miller and Gill (1998)

Strictly speaking, metadata should describe the properties of an object which is itself data, for example a web page, a digital image or a database - this is analogous to the librarian's practice of cataloguing 'the thing in hand'. But with networked resources, these properties are often not very interesting or useful for discovery; for example, if a researcher is interested in discovering images of famous artworks on the web, they would generally search using the properties of the original artworks (e.g. CREATOR = Picasso, DATE = 1937), not the properties of the digital copies or 'surrogates' of them (e.g. CREATOR = Scan-O-Matic Imaging Labs Ltd., DATE = 1997).

This problem is exacerbated by the fact that networked resources can contain a large number of digital objects that have been derived from diverse sources; for example, consider a web page about an architect created by an academic that includes a scanned image of a photograph, taken by a famous photographer, of one of the architect's buildings—who is the creator of this 'digital object'? The architect, the photographer and the academic all have a valid claim to the title CREATOR, and future generations of researchers may even be interested in the creator of the digital surrogate!

All these problems are difficult to solve. Even if it is eventually solved, any solution is likely to be difficult to implement. Since our efforts concern a relatively homogeneous collection of data, it appears sensible to develop our own format and standards, which are much easier to develop and implement for a more homogeneous body of knowledge. We will keep a close eye on developments with the Dublin Core and hope that one day, we will be able to express our holdings in an extended Dublin Core-based set.

## 10 Conclusions

In this section, we would like to point out some overall features of the proposal that should be made more evident at this stage.

The cost of dissemination of research is only a tiny fraction of the total cost of research. If the process is decentralized, those modest costs can be readily absorbed by the existing institutions that support research. What we need to advance this process is a coordination scheme, associated with the proper incentives, to ensure that the work supported by each research institution becomes part of a coherent body of knowledge. With today's Internet technology, available even in the most remote reaches of the Third World, this becomes technically feasible. The issues are largely organizational: for instance, basing the coordination on freely available software that may be installed and operated on a variety of platforms without advanced technical expertise. Our research endeavors to further develop a blueprint with which this coordination can be achieved, and to validating that blueprint within the discipline of economics.

This proposal sets out to strengthen and broaden what is essentially a collaborative academic effort that started six years ago without any funding, and that can sustain itself without funding at a level where the underlying concepts are unable to be realized to their full potential. We propose to strengthen the project through the inclusion of personal data and through online peer review, as well as broaden it from research preprints to incorporate dataset and software collections.

This research seeks to further our understanding of digital library systems that are open, self-managed and self-sustained through decentralization. The research will identify incentive mechanisms that will encourage the registration of academics, and will involve the construction of large-scale whitepage services that academics can use to facilitate contacts and that librarians can use to describe personal data in a way that its updates are assured. The software and data collection efforts will further our understanding of the difficult metadata issues that these materials raise, and lead to important new technical developments at the interface between data and their usage by software tools. The metadata issues of data and software should be useful to the Dublin Core community as well as library science groups working in the field.

The investigators have the experience that is necessary to ensure that the research will be successful. The RePEc working paper archive system, started by Thomas Krichel and two European collaborating groups, contains current holdings of working papers that dwarf its origins. Christopher F. Baum pioneered the integration of software components' metadata into the RePEc dataset in 1997, and the present collaboration is an effort to bring his ideas to their full potential by extending metadata to incorporate dataset holdings as well as software tools. The project management will require each side to concentrate on delivering certain aspects of the system. However, the peer-review and the personal information components require dissemination activities worldwide, so that an international collaborative effort is best suited to these deliverables. Although formal support is only sought for the US and UK collaborators, the nature of this project—as an extension and strengthening of RePEc—will marshal the continuing guidance and efforts of those academics around the world who presently play important roles in the RePEc project, who maintain archives and/or offer services. They include José Manuel Barrueco Cruz in Valencia (EconWeb), Sune Karlsson in Stockholm (S-WoPEc), Sergei Parinov in Novosibirsk (RuPEc) Bob Parks in St. Louis, (EconWPA), Corry Stuyts in the Netherlands (DEGREE), Thorsten Wichmann in Berlin (INOMICS), Satoshi Yasuda in Tokyo (Asian Economic Statistics Project) and Christian Zimmermann in Montréal (IDEAS).

The results of the Economics Distributed Electronic Library project will bring great benefits to the academic discipline of economics worldwide. It will also be used by research institutes, government and supranational agencies, and some private firms. Since the deliverables are free, it will be of particular benefit to economists in developing nations, who have heretofore enjoyed very restricted access to US and European research work in progress due to high costs of search and acquisition. This project will ensure that research findings, software tools, and datasets relevant to a researcher's interests may be located and accessed. Since the project is based on free and freely extensible material and the willing participation of academics in supplying that material, it will go a long way toward making economic research more accessible. However we are convinced that the impact of the project will be felt outside economics, in that it will be a rôle model which other academic disciplines can use to their advantage in dealing with the transition from paper-based commercial publishing to free electronic publishing. Libraries are inevitably caught up in this process of change, and this proposal provides a well-defined model of change that would make the provision of services for even the smallest academic library more affordable through the international collaboration of researchers.

# EDEL Budget Appendix for JISC

Thomas Krichel

January 1999

## 1 Introduction

This is an appendix to the EDEL application submitted to the National Science Foundation and the Joint Information Systems Committee, as a response to Announcement Number NSF 99-6 and to JISC Circular 98/15, respectively. EDEL is jointly published on the WWW at <http://netec.wustl.edu/AcMeS/edel.html> in the United States, and at <http://netec.mcc.ac.uk/AcMeS/edel.html> in the United Kingdom.) EDEL is also available as a PDF document at <http://netec.wustl.edu/AcMeS/edel.letter.pdf> in the United States and at <http://netec.mcc.ac.uk/AcMeS/edel.A4.pdf> in the United Kingdom.

This appendix is available on the WWW at <http://netec.wustl.edu/AcMeS/edeljisc.html> in the United States, and at <http://netec.mcc.ac.uk/AcMeS/edeljisc.html> in the United Kingdom.) EDEL is also available as a PDF document at <http://netec.wustl.edu/AcMeS/edeljisc.letter.pdf> in the United States and at <http://netec.mcc.ac.uk/AcMeS/edeljisc.A4.pdf> in the United Kingdom. After this introduction, it contains the budget statement for JISC.

## 2 Budget

The proposal is for funding over three years. I will be working full time on the project for three years. The department will release me from all my duties. I will be housed either in the department or in the library. I will be starting on my current wage at point 1 on the lecturer B scale, and raise each year, with the increment date on 1 February. The current figure, includ-

ing NI and superannuation is £2786. Therefore I budget that cost as £28k, £30k, £32k, which leave some room for pay awards, but none for promotion. We will hire a 3/4 of the full time of a foreign technical consultant at point 1 on the research 1B scale, and raising on the scale with an assumption of a 3% pay award. This will cost £12k, £13k, £14k in years one, two and three, respectively.

In addition, there should be a high performance PC purchased for technical development costing £2k in the first year but there is no further equipment cost. Last we budget £2k per year for other costs, including travel. Therefore the cost is £44k in the first year, £45k for the second year and £48k for the third year.

| item              | year 1 | year 2 | year 3 |
|-------------------|--------|--------|--------|
| project director  | 28     | 30     | 32     |
| computing support | 12     | 13     | 14     |
| capital items     | 2      | 0      | 0      |
| other costs       | 2      | 2      | 2      |



# UniS

7 January 1999

Mr S M Griffin  
National Science Foundation  
Division of Information and Intelligent Systems  
4201 Wilson Boulevard  
Arlington, VA 22230  
USA

## University of Surrey

Guildford  
Surrey GU2 6XH, UK  
Telephone  
+44 (0)1483 300800  
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## From the Vice-Chancellor

Professor  
Patrick J Dowling  
FEng FRS

Vice-Chancellor  
& Chief Executive

Telephone  
+44 (0)1483 259249  
Facsimile  
+44 (0)1483 259510  
Email  
p.dowling@surrey.ac.uk

Dear Mr Griffin

### **Economics Distributed Electronic Library**

I am pleased to confirm that the University of Surrey will be collaborating with the Boston College on the proposal "EDEL: Economics Distributed Electronic Library". The source of funding in this country will be the Joint Information Systems Committee (JISC). Dr Thomas Krichel of our Economics Department has submitted an application to JISC under JISC circular 98/15. The proposal has the University of Surrey's full endorsement. Should you have any queries regarding the project these should be addressed to Dr Krichel (tel. +44 1483 300800 ext. 6958).

Yours sincerely

cc: Dr Krichel, Economics Department, University of Surrey  
Mr T Crawshaw, Director of Information Services, University of Surrey



# EDEL: Economics Distributed Electronic Library

January 1999

## References

- Association of Research Libraries (1997). Scholarly Communication and the Need for Collective Action. *ARL Discussion Paper* <http://www.arl.org/sparc/discuss.html>
- CodEc. CodEc-Programs for Economics and Econometrics. <http://netec.wustl.edu/CodEc/CodEc.html>
- Dublin Core. Dublin Core Metadata Initiative. <http://www.purl.org/dc>
- ERN. Economics Research Network. <http://www.ssrn.com/>
- EconWPA. Economics Working Paper Archive. <http://econwpa.wustl.edu/>
- William L. Goffe (April, 1998). Resources for Economists on the Internet. <http://econwpa.wustl.edu/EconFAQ/EconFAQ.html>
- HoPEc. Home Pages in Economics. <http://netec.wustl.edu/HoPEc/>
- IDEAS. Internet Documents in Economics Access Service. <http://ideas.uqam.ca>
- Paul Miller and Tony Gill (1998). DC5: The search for Santa. *Ariadne 12* <http://www.ariadne.ac.uk/issue12/metadata/>
- NEP. New Economics Papers. <http://netec.wustl.edu/NEP/>
- NetEc. Networked Resources in Economics. <http://netec.wustl.edu/>
- ReDIF. Research Documents Information Format. <http://netec.wustl.edu/RePEc/ReDIF.html>
- RePEc. Research Papers in Economics. <http://netec.wustl.edu/RePEc/>

# Biographical Sketch

Christopher F. Baum

January 1999

Address: Department of Economics, Boston College, Chestnut Hill MA 02467-3806 USA

Telephone/Fax/Email: +1-617-552-3673, +1-617-552-2308, baum@bc.edu

## Education:

Kalamazoo College, B.A. with Honors in Economics, 1972

Florida Atlantic University, M.A. in Economics, 1973

The University of Michigan, Ph.D. in Economics, 1977

## Positions:

Assistant Professor of Economics, Boston College, 1977-1983

Associate Professor of Economics, Boston College, 1983-

## Professional Honors:

Editorial Board, Computational Economics, 1990-

Secretary-Treasurer, Society for Economic Dynamics and Control, 1989-1992

*Who's Who in the East, 1999-2000*, 27th edition, 1998

## Publications:

"Persistence in International Inflation Rates," with John Barkoulas and Mustafa Caglayan, 1999. Forthcoming, Southern Economic Journal. Preprint: <http://fmwww.bc.edu/ec-p/wp333.pdf>.

"Fractional Monetary Dynamics," with John Barkoulas and Mustafa Caglayan, 1999. Forthcoming, Applied Economics. Preprint: <http://fmwww.bc.edu/ec-p/wp321.pdf>.

"Modelling Federal Reserve Discount Policy," with Meral Karasulu, 1998. Computational Economics, 11, 53-70.

"Fractional Differencing Modeling and Forecasting of Eurocurrency Deposit Rates," with John T. Barkoulas, 1997. Journal of Financial Research, 20:3, 355-372.

"Factor-GARCH Modeling of the Treasury Term Structure," with Basma Bekdache, 1997. In Computational Approaches to Economic Problems, H. Amman, B. Rustem and A. Whinston, eds. Dordrecht: Kluwer Academic Publishers.

"Time-Varying Risk Premia in the Foreign Currency Futures Basis," with J. Barkoulas, 1996. Journal of Futures Markets 16:7, 735-755.

"Tobin's Q, Intangible Capital, and Financial Policy," with M. Klock and C. Thies, 1996. Journal of Economics and Business, 48:387-400.

“On the Construction of Monthly Term Structures of U.S. Interest Rates, 1919-1930,” with C. Thies, 1992. *Computer Science in Economics and Management*, 5:221-246.

“Analyzing the Stability of Demand-for-Money Equations via Bounded-Influence Estimation Techniques,” 1990, with M. Furno, *Journal of Money, Credit and Banking*, 22:4, 465-477.

“Computational Aspects of Robust Estimators for Linear Regressions,” 1989, with M. Furno, *Computer Science in Economics and Management*, 2: 221-237.

**List of Collaborators within last 48 months:**

John T. Barkoulas, Louisiana Tech University; Mustafa Caglayan, Koc University, Istanbul; Basma Bekdache, Wayne State University; Meral Karasulu, International Monetary Fund; Clifford F. Thies, Shenandoah University; Atreya Chakraborty, Brandeis University; Nickolaos Travlos, Athens University of Economics and Business; Gabriela Florescu, ICI, Bucharest; Gurkan Oguz, private sector, Toronto; Joseph Onochie, Baruch College; B. Mak Arvin, University of Trent; Mark S. Klock, George Washington University

**Graduate Advisees within last five years:**

Neslihan Ozkan, private sector, Istanbul; S. Gurcan Gulen, University of Houston; Meral Karasulu, International Monetary Fund; Van Newby, Brigham Young University; John Barkoulas, Louisiana Tech University; Basma Bekdache, Wayne State University; Olin Liu, International Monetary Fund; Xiaoqiang Hu, Claremont McKenna College; Mustafa Caglayan, Koc University, Istanbul; Wenjie Fan, Chase Manhattan Bank; John S. Jordan, Federal Reserve Bank of Boston; Atreya Chakraborty, Brandeis University

Total Ph.D.'s advised: 15 (director or co-director), 19 (reader), latter including students from University of Texas-Austin and University of New Hampshire.

**Graduate Advisors:**

E. Philip Howrey, The University of Michigan  
William B. Stronge, Florida Atlantic University

**Previous NSF Support:** None.

**Summary of Qualifications**

Christopher F. Baum is a quantitative monetary economist with broad interests in computing and the potential of the Internet in economic research. He is one of the charter members of the Society for Computational Economics, and the co-host for that society's international conference at Boston College in June 1999. He has participated in the development of Internet resources for economics—such as the RePEc archive for Statistical Software Components—and the training of faculty colleagues for effective use of Internet resources, SQL, and econometric languages such as Mathematica, MATLAB, RATS, and Stata in conjunction with the Boston College library staff. He has served as Faculty Technology Coordinator for the Department of Economics for the past five years, initiating and managing the department's presence on the Internet. Baum has served as a member of the University's Academic Technology Committee and Strategic Planning committees for computing and communications.



# Biographical Sketch

Thomas Krichel

January 1999

Address: Department of Economics, University of Surrey, Guildford GU2 5XH, Royaume Uni  
Telephone/Fax/Email: +44-01483-876958, +44-01483-303775, T.Krichel@surrey.ac.uk

## Education:

Université des Sciences Sociales de Toulouse: Diplôme d'Etudes Universitaires Générales in sciences économiques, 1986

Université de Paris I Panthéon-Sorbonne, Ecole Normale Supérieure de la rue d'Ulm Ecole des Hautes Etudes en Sciences Sociales: Magistère d'Economie, 1989

University of Exeter: MA in Western European Studies, 1990

University of Surrey: PhD, 1998

## Positions:

Banking Societies' Trust research assistant at Loughborough University 1990–1992

Houblon-Norman research assistant, at Keele University, 1992–1993

Lecturer in economics, at the University of Surrey, 1993–1999

## Professional Honors:

none.

## Publications:

“Output Trends in EC Countries and the Implications for Transition to Monetary Union” (with Apostolos Serletis), *Economics Letters* 1992, Vol. 40, No. 2, pp. 211–216

“Internet Primer for Economists” (with Thorsten Wichmann), *Economic Journal* 1994 Vol. 104, No. 427, pp. 1496–1523

“Seigniorage, Taxation and Myopia in EMU”, University of Leicester CEES Discussion Paper No. 5, 1994, <ftp://www.econ.surrey.ac.uk/pub/RePEc/sur/surrec/surrec9401.pdf>

“International Evidence on the long-run Implications of the Neoclassical Growth-Model” (with Apostolos Serletis), *Applied Economics* 1995, Vol. 27, No. 2, pp. 205–210

“Growth, Debt and Public Infrastructure”, (with Paul Levine), *Economics of Planning* 1995, Vol. 28, pp. 119–146

“Dynamic Aspects of Growth and Fiscal Policy”, (with Paul Levine), Surrey Economics Electronic Discussion Paper, 1995, <ftp://www.econ.surrey.ac.uk/pub/RePEc/sur/surrec/surrec9501.pdf>

“Fiscal and Monetary Policy in a Monetary Union: Credible Inflation Targets or Monetised Debt?”, (with Paul Levine and Joseph Pearlman), *Weltwirtschaftliches Archiv*, 1996

“WoPEc: Electronic working papers in Economics Services”, *Ariadne*, Issue 8, March 1997

“About NetEc, with special reference to WoPEc”, *CHEER* Volume 11, Issue 1, 1997, pp. 19–24

“The Welfare Economics of Rural to Urban Migration: The Harris-Todaro Model Revisited”, (with Paul Levine), University of Surrey Economics Electronic Discussion Paper, 1997, <ftp://www.econ.surrey.ac.uk/pub/RePEc/sur/surrec/surrec9701.pdf>

surrey.ac.uk/pub/RePEc/sur/surrec/surrec9702.pdf, forthcoming in the Journal of Regional Science

"Growing at Different Rates", University of Surrey Economics Electronic Discussion Paper, 1998, <ftp://www.econ.surrey.ac.uk/pub/RePEc/sur/surrec/surrec9801.pdf>

**List of Collaborators within last 48 months:**

Jose-Manuel Barrueco Cruz, University of Valencia; Sergei Parinov, Siberian Branch of the Russian Academy of Sciences, Novosibirsk; Paul Levine, University of Surrey, Guildford; Markus Klink, University of Mannheim;

**Graduate Advisees within last five years:**

Marco Catenaro, Milan; Elena Marouli, Guildford;  
Total Ph.D.'s advised: 2 (director or co-director)

**Previous NSF Support:**

None, not eligible

**Summary of Qualifications**

Thomas Krichel is a quantitative macroeconomist with interest in the analysis of optimal economic policy, with particular reference to the process of European unification. His recent work has examined time-consistency aspects in fiscal policy. He is German born but also speaks English, French and Spanish and he is learning Russian. He has extensive unix computing skills. He has a growing interest in the electronic publishing and academic metadata systems. In February 1993, he founded the WoPEc project for the electronic dissemination of research papers in economics. It published the world's first electronic research document in the discipline in April of the same year. Since 1996 WoPEc has received funding from the Joint Information Systems Committee of the United Kingdom's Higher Education Funding Councils. Total support from JISC has been in excess of £100k between 1996 and 1999. In 1997 he founded RePEc, an effort to develop a relational database that would completely describe the state of economics. In 1999 he will found the Academic Metadata System (AcMeS) to generalise the concepts underlying RePEc to other disciplines and the Consortium of Research Documenting Authorities (CoReDA) to oversee the implementation of AcMeS.

**SUMMARY PROPOSAL BUDGET YEAR 1**

|   |  |  |      | FOR NSF USE ONLY                |                    |                             |
|---|--|--|------|---------------------------------|--------------------|-----------------------------|
| ORGANIZATION<br><b>Boston College</b>   |  |  |      | PROPOSAL NO.                    |                    | DURATION (months)           |
| PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR<br><b>Christopher F Baum</b>  |  |  |      | AWARD NO.                       |                    |                             |
| A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates<br>(List each separately with title, A.7. show number in brackets) |  |  |      | NSF Funded Person-mos.          |                    | Funds Requested By proposer |
|   |  |  |      | CAL                             | ACAD               | SUMR                        |
| 1. <b>Christopher F Baum - Assoc. Professor</b>   |  |  |      | 0.00                            | 0.00               | 2.00                        |
| 2.  |  |  |      |                                 |                    |                             |
| 3.  |  |  |      |                                 |                    |                             |
| 4.  |  |  |      |                                 |                    |                             |
| 5.  |  |  |      |                                 |                    |                             |
| 6. ( 0 ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)  |  |  |      | 0.00                            | 0.00               | 0.00                        |
| 7. ( 1 ) TOTAL SENIOR PERSONNEL (1 - 6)   |  |  |      | 0.00                            | 0.00               | 2.00                        |
| B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)   |  |  |      |                                 |                    |                             |
| 1. ( 0 ) POST DOCTORAL ASSOCIATES   |  |  |      | 0.00                            | 0.00               | 0.00                        |
| 2. ( 0 ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)   |  |  |      | 0.00                            | 0.00               | 0.00                        |
| 3. ( 2 ) GRADUATE STUDENTS  |  |  |      |                                 |                    | 33,500                      |
| 4. ( 0 ) UNDERGRADUATE STUDENTS   |  |  |      |                                 |                    | 0                           |
| 5. ( 0 ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)   |  |  |      |                                 |                    | 0                           |
| 6. ( 0 ) OTHER  |  |  |      |                                 |                    | 0                           |
| TOTAL SALARIES AND WAGES (A + B)  |  |  |      |                                 |                    | 52,211                      |
| C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)   |  |  |      |                                 |                    | 4,584                       |
| TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)   |  |  |      |                                 |                    | 56,795                      |
| D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)   |  |  |      |                                 |                    |                             |
| <b>9.1 Gb SCSI Disk Drive for IBM RS/6000</b>   |  |  |      | \$                              |                    | 2,310                       |
| TOTAL EQUIPMENT   |  |  |      |                                 |                    | 2,310                       |
| E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)   |  |  |      |                                 |                    | 0                           |
| 2. FOREIGN  |  |  |      |                                 |                    | 1,500                       |
| F. PARTICIPANT SUPPORT COSTS  |  |  |      |                                 |                    |                             |
| 1. STIPENDS \$ _____  |  |  |      |                                 |                    | 0                           |
| 2. TRAVEL _____   |  |  |      |                                 |                    | 0                           |
| 3. SUBSISTENCE _____  |  |  |      |                                 |                    | 0                           |
| 4. OTHER _____  |  |  |      |                                 |                    | 0                           |
| ( 0 ) TOTAL PARTICIPANT COSTS   |  |  |      |                                 |                    | 0                           |
| G. OTHER DIRECT COSTS   |  |  |      |                                 |                    |                             |
| 1. MATERIALS AND SUPPLIES   |  |  |      |                                 |                    | 1,500                       |
| 2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION  |  |  |      |                                 |                    | 0                           |
| 3. CONSULTANT SERVICES  |  |  |      |                                 |                    | 14,400                      |
| 4. COMPUTER SERVICES  |  |  |      |                                 |                    | 0                           |
| 5. SUBAWARDS  |  |  |      |                                 |                    | 0                           |
| 6. OTHER  |  |  |      |                                 |                    | 0                           |
| TOTAL OTHER DIRECT COSTS  |  |  |      |                                 |                    | 15,900                      |
| H. TOTAL DIRECT COSTS (A THROUGH G)   |  |  |      |                                 |                    | 76,505                      |
| I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)  |  |  |      |                                 |                    |                             |
| <b>% of MTDC (Rate: 53.00, Base: 74195)</b>   |  |  |      |                                 |                    |                             |
| TOTAL INDIRECT COSTS (F&A)  |  |  |      |                                 |                    | 39,323                      |
| J. TOTAL DIRECT AND INDIRECT COSTS (H + I)  |  |  |      |                                 |                    | 115,828                     |
| K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)  |  |  |      |                                 |                    | 0                           |
| L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)  |  |  |      |                                 |                    | \$ 115,828                  |
| M. COST SHARING PROPOSED LEVEL \$ 0   |  |  |      | AGREED LEVEL IF DIFFERENT \$    |                    |                             |
| PI / PD TYPED NAME & SIGNATURE*   |  |  | DATE | FOR NSF USE ONLY                |                    |                             |
| <b>Christopher F Baum</b>   |  |  |      | INDIRECT COST RATE VERIFICATION |                    |                             |
| ORG. REP. TYPED NAME & SIGNATURE*   |  |  | DATE | Date Checked                    | Date Of Rate Sheet | Initials - ORG              |

## SUMMARY PROPOSAL BUDGET COMMENTS - Year 1

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**\*\* C- Fringe Benefits**

Calculated at 24.5% of professional salaries.

**SUMMARY PROPOSAL BUDGET YEAR 2**

| ORGANIZATION<br><b>Boston College</b>   |   |    |      | FOR NSF USE ONLY                |                    |                |                             |                                     |
|---|---|----|------|---------------------------------|--------------------|----------------|-----------------------------|-------------------------------------|
|   |   |    |      | PROPOSAL NO.                    | DURATION (months)  |                |                             |                                     |
| PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR<br><b>Christopher F Baum</b>  |   |    |      | AWARD NO.                       | Proposed           | Granted        |                             |                                     |
| A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates<br>(List each separately with title, A.7. show number in brackets) |   |    |      | NSF Funded Person-mos.          |                    |                | Funds Requested By proposer | Funds granted by NSF (if different) |
|   |   |    |      | CAL                             | ACAD               | SUMR           |                             |                                     |
| 1.  | <b>Christopher F Baum - Assoc.Professor</b>                   |    |      | 0.00                            | 0.00               | 2.00           | \$ 19,647                   | \$                                  |
| 2.  |   |    |      |                                 |                    |                |                             |                                     |
| 3.  |   |    |      |                                 |                    |                |                             |                                     |
| 4.  |   |    |      |                                 |                    |                |                             |                                     |
| 5.  |   |    |      |                                 |                    |                |                             |                                     |
| 6.  | ( 0 ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE) |    |      | 0.00                            | 0.00               | 0.00           | 0                           |                                     |
| 7.  | ( 1 ) TOTAL SENIOR PERSONNEL (1 - 6)                          |    |      | 0.00                            | 0.00               | 2.00           | 19,647                      |                                     |
| B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)   |   |    |      |                                 |                    |                |                             |                                     |
| 1.  | ( 0 ) POST DOCTORAL ASSOCIATES                                |    |      | 0.00                            | 0.00               | 0.00           | 0                           |                                     |
| 2.  | ( 0 ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)      |    |      | 0.00                            | 0.00               | 0.00           | 0                           |                                     |
| 3.  | ( 2 ) GRADUATE STUDENTS                                       |    |      |                                 |                    |                | 34,505                      |                                     |
| 4.  | ( 0 ) UNDERGRADUATE STUDENTS                                  |    |      |                                 |                    |                | 0                           |                                     |
| 5.  | ( 0 ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)            |    |      |                                 |                    |                | 0                           |                                     |
| 6.  | ( 0 ) OTHER   |    |      |                                 |                    |                | 0                           |                                     |
| TOTAL SALARIES AND WAGES (A + B)  |   |    |      |                                 |                    |                | 54,152                      |                                     |
| C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)   |   |    |      |                                 |                    |                | 4,813                       |                                     |
| TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)   |   |    |      |                                 |                    |                | 58,965                      |                                     |
| D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)   |   |    |      |                                 |                    |                |                             |                                     |
| TOTAL EQUIPMENT   |   |    |      |                                 |                    |                | 0                           |                                     |
| E. TRAVEL   |   |    |      |                                 |                    |                |                             |                                     |
| 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)   |   |    |      |                                 |                    |                | 0                           |                                     |
| 2. FOREIGN  |   |    |      |                                 |                    |                | 1,500                       |                                     |
| F. PARTICIPANT SUPPORT COSTS  |   |    |      |                                 |                    |                |                             |                                     |
| 1.  | STIPENDS  | \$ | 0    |                                 |                    |                |                             |                                     |
| 2.  | TRAVEL  |    | 0    |                                 |                    |                |                             |                                     |
| 3.  | SUBSISTENCE   |    | 0    |                                 |                    |                |                             |                                     |
| 4.  | OTHER   |    | 0    |                                 |                    |                |                             |                                     |
| ( 0 ) TOTAL PARTICIPANT COSTS   |   |    |      |                                 |                    |                | 0                           |                                     |
| G. OTHER DIRECT COSTS   |   |    |      |                                 |                    |                |                             |                                     |
| 1.  | MATERIALS AND SUPPLIES  |    |      |                                 |                    |                | 1,500                       |                                     |
| 2.  | PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION                 |    |      |                                 |                    |                | 0                           |                                     |
| 3.  | CONSULTANT SERVICES   |    |      |                                 |                    |                | 15,120                      |                                     |
| 4.  | COMPUTER SERVICES   |    |      |                                 |                    |                | 0                           |                                     |
| 5.  | SUBAWARDS   |    |      |                                 |                    |                | 0                           |                                     |
| 6.  | OTHER   |    |      |                                 |                    |                | 0                           |                                     |
| TOTAL OTHER DIRECT COSTS  |   |    |      |                                 |                    |                | 16,620                      |                                     |
| H. TOTAL DIRECT COSTS (A THROUGH G)   |   |    |      |                                 |                    |                | 77,085                      |                                     |
| I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)  |   |    |      |                                 |                    |                |                             |                                     |
| % of MTDC (Rate: 53.00, Base: 77085)  |   |    |      |                                 |                    |                |                             |                                     |
| TOTAL INDIRECT COSTS (F&A)  |   |    |      |                                 |                    |                | 40,855                      |                                     |
| J. TOTAL DIRECT AND INDIRECT COSTS (H + I)  |   |    |      |                                 |                    |                | 117,940                     |                                     |
| K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)  |   |    |      |                                 |                    |                | 0                           |                                     |
| L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)  |   |    |      |                                 |                    |                | \$ 117,940                  | \$                                  |
| M. COST SHARING PROPOSED LEVEL \$ 0   |   |    |      | AGREED LEVEL IF DIFFERENT \$    |                    |                |                             |                                     |
| PI / PD TYPED NAME & SIGNATURE*   |   |    | DATE | FOR NSF USE ONLY                |                    |                |                             |                                     |
| <b>Christopher F Baum</b>   |   |    |      | INDIRECT COST RATE VERIFICATION |                    |                |                             |                                     |
| ORG. REP. TYPED NAME & SIGNATURE*   |   |    | DATE | Date Checked                    | Date Of Rate Sheet | Initials - ORG |                             |                                     |

**SUMMARY PROPOSAL BUDGET YEAR 3**

| ORGANIZATION<br><b>Boston College</b>   |  |  |      | FOR NSF USE ONLY                |                    |                             |                                     |
|---|--|--|------|---------------------------------|--------------------|-----------------------------|-------------------------------------|
|   |  |  |      | PROPOSAL NO.                    | DURATION (months)  |                             |                                     |
| PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR<br><b>Christopher F Baum</b>  |  |  |      | AWARD NO.                       | Proposed           | Granted                     |                                     |
| A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates<br>(List each separately with title, A.7. show number in brackets) |  |  |      | NSF Funded Person-mos.          |                    | Funds Requested By proposer | Funds granted by NSF (if different) |
|   |  |  |      | CAL                             | ACAD               | SUMR                        |                                     |
| 1. <b>Christopher F Baum - Assoc.Professor</b>  |  |  |      | 0.00                            | 0.00               | 2.00                        | \$ 20,629                           |
| 2.  |  |  |      |                                 |                    |                             |                                     |
| 3.  |  |  |      |                                 |                    |                             |                                     |
| 4.  |  |  |      |                                 |                    |                             |                                     |
| 5.  |  |  |      |                                 |                    |                             |                                     |
| 6. ( 0 ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)  |  |  |      | 0.00                            | 0.00               | 0.00                        | 0                                   |
| 7. ( 1 ) TOTAL SENIOR PERSONNEL (1 - 6)   |  |  |      | 0.00                            | 0.00               | 2.00                        | 20,629                              |
| B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)   |  |  |      |                                 |                    |                             |                                     |
| 1. ( 0 ) POST DOCTORAL ASSOCIATES   |  |  |      | 0.00                            | 0.00               | 0.00                        | 0                                   |
| 2. ( 0 ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)   |  |  |      | 0.00                            | 0.00               | 0.00                        | 0                                   |
| 3. ( 2 ) GRADUATE STUDENTS  |  |  |      |                                 |                    |                             | 35,540                              |
| 4. ( 0 ) UNDERGRADUATE STUDENTS   |  |  |      |                                 |                    |                             | 0                                   |
| 5. ( 0 ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)   |  |  |      |                                 |                    |                             | 0                                   |
| 6. ( 0 ) OTHER  |  |  |      |                                 |                    |                             | 0                                   |
| TOTAL SALARIES AND WAGES (A + B)  |  |  |      |                                 |                    |                             | 56,169                              |
| C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)   |  |  |      |                                 |                    |                             | 5,054                               |
| TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)   |  |  |      |                                 |                    |                             | 61,223                              |
| D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)   |  |  |      |                                 |                    |                             |                                     |
| TOTAL EQUIPMENT   |  |  |      |                                 |                    |                             | 0                                   |
| E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)   |  |  |      |                                 |                    |                             | 0                                   |
| 2. FOREIGN  |  |  |      |                                 |                    |                             | 1,500                               |
| F. PARTICIPANT SUPPORT COSTS  |  |  |      |                                 |                    |                             |                                     |
| 1. STIPENDS \$ _____  |  |  |      |                                 |                    |                             | 0                                   |
| 2. TRAVEL _____   |  |  |      |                                 |                    |                             | 0                                   |
| 3. SUBSISTENCE _____  |  |  |      |                                 |                    |                             | 0                                   |
| 4. OTHER _____  |  |  |      |                                 |                    |                             | 0                                   |
| ( 0 ) TOTAL PARTICIPANT COSTS   |  |  |      |                                 |                    |                             | 0                                   |
| G. OTHER DIRECT COSTS   |  |  |      |                                 |                    |                             |                                     |
| 1. MATERIALS AND SUPPLIES   |  |  |      |                                 |                    |                             | 1,500                               |
| 2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION  |  |  |      |                                 |                    |                             | 0                                   |
| 3. CONSULTANT SERVICES  |  |  |      |                                 |                    |                             | 15,876                              |
| 4. COMPUTER SERVICES  |  |  |      |                                 |                    |                             | 0                                   |
| 5. SUBAWARDS  |  |  |      |                                 |                    |                             | 0                                   |
| 6. OTHER  |  |  |      |                                 |                    |                             | 0                                   |
| TOTAL OTHER DIRECT COSTS  |  |  |      |                                 |                    |                             | 17,376                              |
| H. TOTAL DIRECT COSTS (A THROUGH G)   |  |  |      |                                 |                    |                             | 80,099                              |
| I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)<br>% of MTDC (Rate: 53.00, Base: 80099)  |  |  |      |                                 |                    |                             |                                     |
| TOTAL INDIRECT COSTS (F&A)  |  |  |      |                                 |                    |                             | 42,452                              |
| J. TOTAL DIRECT AND INDIRECT COSTS (H + I)  |  |  |      |                                 |                    |                             | 122,551                             |
| K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)  |  |  |      |                                 |                    |                             | 0                                   |
| L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)  |  |  |      |                                 |                    |                             | \$ 122,551                          |
| M. COST SHARING PROPOSED LEVEL \$ 0   |  |  |      | AGREED LEVEL IF DIFFERENT \$    |                    |                             |                                     |
| PI / PD TYPED NAME & SIGNATURE*   |  |  | DATE | FOR NSF USE ONLY                |                    |                             |                                     |
| <b>Christopher F Baum</b>   |  |  |      | INDIRECT COST RATE VERIFICATION |                    |                             |                                     |
| ORG. REP. TYPED NAME & SIGNATURE*   |  |  | DATE | Date Checked                    | Date Of Rate Sheet | Initials - ORG              |                                     |

**SUMMARY Cumulative  
PROPOSAL BUDGET**

| ORGANIZATION<br><b>Boston College</b>   |  |  |      | FOR NSF USE ONLY                |                    |                             |                                     |
|---|--|--|------|---------------------------------|--------------------|-----------------------------|-------------------------------------|
|   |  |  |      | PROPOSAL NO.                    | DURATION (months)  |                             |                                     |
| PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR<br><b>Christopher F Baum</b>  |  |  |      | AWARD NO.                       |                    |                             |                                     |
| A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates<br>(List each separately with title, A.7. show number in brackets) |  |  |      | NSF Funded Person-mos.          |                    | Funds Requested By proposer | Funds granted by NSF (if different) |
|   |  |  |      | CAL                             | ACAD               |                             |                                     |
| 1. <b>Christopher F Baum - Assoc.Professor</b>  |  |  |      | 0.00                            | 0.00               | 6.00                        | \$ 58,987                           |
| 2.  |  |  |      |                                 |                    |                             |                                     |
| 3.  |  |  |      |                                 |                    |                             |                                     |
| 4.  |  |  |      |                                 |                    |                             |                                     |
| 5.  |  |  |      |                                 |                    |                             |                                     |
| 6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)  |  |  |      | 0.00                            | 0.00               | 0.00                        | 0                                   |
| 7. ( <b>1</b> ) TOTAL SENIOR PERSONNEL (1 - 6)  |  |  |      | 0.00                            | 0.00               | 6.00                        | 58,987                              |
| B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)   |  |  |      |                                 |                    |                             |                                     |
| 1. ( <b>0</b> ) POST DOCTORAL ASSOCIATES  |  |  |      | 0.00                            | 0.00               | 0.00                        | 0                                   |
| 2. ( <b>0</b> ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)  |  |  |      | 0.00                            | 0.00               | 0.00                        | 0                                   |
| 3. ( <b>6</b> ) GRADUATE STUDENTS   |  |  |      |                                 |                    |                             | 103,545                             |
| 4. ( <b>0</b> ) UNDERGRADUATE STUDENTS  |  |  |      |                                 |                    |                             | 0                                   |
| 5. ( <b>0</b> ) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)  |  |  |      |                                 |                    |                             | 0                                   |
| 6. ( <b>0</b> ) OTHER   |  |  |      |                                 |                    |                             | 0                                   |
| TOTAL SALARIES AND WAGES (A + B)  |  |  |      |                                 |                    |                             | 162,532                             |
| C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)   |  |  |      |                                 |                    |                             | 14,451                              |
| TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)   |  |  |      |                                 |                    |                             | 176,983                             |
| D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)   |  |  |      |                                 |                    |                             |                                     |
|   |  |  |      | \$                              |                    | 2,310                       |                                     |
| TOTAL EQUIPMENT   |  |  |      |                                 |                    |                             | 2,310                               |
| E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)   |  |  |      |                                 |                    |                             | 0                                   |
| 2. FOREIGN  |  |  |      |                                 |                    |                             | 4,500                               |
| F. PARTICIPANT SUPPORT COSTS  |  |  |      |                                 |                    |                             |                                     |
| 1. STIPENDS \$ _____  |  |  |      |                                 |                    |                             | 0                                   |
| 2. TRAVEL _____   |  |  |      |                                 |                    |                             | 0                                   |
| 3. SUBSISTENCE _____  |  |  |      |                                 |                    |                             | 0                                   |
| 4. OTHER _____  |  |  |      |                                 |                    |                             | 0                                   |
| ( <b>0</b> ) TOTAL PARTICIPANT COSTS  |  |  |      |                                 |                    |                             | 0                                   |
| G. OTHER DIRECT COSTS   |  |  |      |                                 |                    |                             |                                     |
| 1. MATERIALS AND SUPPLIES   |  |  |      |                                 |                    |                             | 4,500                               |
| 2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION  |  |  |      |                                 |                    |                             | 0                                   |
| 3. CONSULTANT SERVICES  |  |  |      |                                 |                    |                             | 45,396                              |
| 4. COMPUTER SERVICES  |  |  |      |                                 |                    |                             | 0                                   |
| 5. SUBAWARDS  |  |  |      |                                 |                    |                             | 0                                   |
| 6. OTHER  |  |  |      |                                 |                    |                             | 0                                   |
| TOTAL OTHER DIRECT COSTS  |  |  |      |                                 |                    |                             | 49,896                              |
| H. TOTAL DIRECT COSTS (A THROUGH G)   |  |  |      |                                 |                    |                             | 233,689                             |
| I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)  |  |  |      |                                 |                    |                             |                                     |
| TOTAL INDIRECT COSTS (F&A)  |  |  |      |                                 |                    |                             | 122,630                             |
| J. TOTAL DIRECT AND INDIRECT COSTS (H + I)  |  |  |      |                                 |                    |                             | 356,319                             |
| K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.D.7.j.)  |  |  |      |                                 |                    |                             | 0                                   |
| L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)  |  |  |      |                                 |                    |                             | \$ 356,319                          |
| M. COST SHARING PROPOSED LEVEL \$ <b>0</b>  |  |  |      | AGREED LEVEL IF DIFFERENT \$    |                    |                             |                                     |
| PI / PD TYPED NAME & SIGNATURE*   |  |  | DATE | FOR NSF USE ONLY                |                    |                             |                                     |
| <b>Christopher F Baum</b>   |  |  |      | INDIRECT COST RATE VERIFICATION |                    |                             |                                     |
| ORG. REP. TYPED NAME & SIGNATURE*   |  |  | DATE | Date Checked                    | Date Of Rate Sheet | Initials - ORG              |                                     |

# EDEL: Economics Distributed Electronic Library

## Budget Justification

January 1999

### A. Salaries and Wages

Christopher F. Baum will be employed for  $\frac{2}{9}$  summer salary under the proposal. The figures for years 2 and 3 have been increased by five per cent per year. He will devote a substantial fraction of his research time throughout the calendar year to management of the project's US components. His teaching load during the project period will be no more than two courses per semester.

The project will hire two graduate students to provide 10 hours/week during the academic year (at an initial stipend of \$11,000 per academic year, in line with other stipends granted by the Department of Economics). Contingent on satisfactory performance, they will be hired to work full time (40 hours/week) during the summer months, for an initial summer stipend of \$5,750. The figures for years 2 and 3 have been increased by three per cent per year in line with historical increases in graduate student stipend levels.

### D. Equipment

The only item of capital equipment specified in the budget is the first-year acquisition of a 9.1 Gb SCSI disk drive to be added to the configuration of `fmrisc.bc.edu`, Economics' UNIX workstation, and dedicated to project use. Maintenance costs of this equipment will be handled by Boston College Information Technology under the blanket maintenance agreement with IBM Corp.

### E.2. Foreign Travel

As specified in Section 7 of the Project Description, this international collaborative project will make use, to the extent possible, of electronic communication between project partners, and between the project directors and the steering committee. However, since face-to-face meetings and discussions between the project directors will be required on occasion, the budget includes funding for limited travel by the PI to the UK collaborators' site. The travel will involve up to one week's stay in the UK, and all efforts will be made to use the least expensive fares consistent with a stay of that duration.

### G.i. Materials and Supplies

Limited funding for materials and supplies will cover the costs of removable storage media for project components and the acquisition of texts on metadata and computer software systems.

### G.iii. Consultant Services

The project will endeavor to retain the services of an extremely skilled programmer/analyst, Ivan Kurmanov of the Belorussian State University in Minsk, Belarus, who has been responsible for design



and implementation of much of the code underlying the current RePEc system. Mr Kurmanov will be employed as a consultant under this project, working under direct supervision of the UK PI, Thomas Krichel, at the University of Surrey. He will provide 60 days' effort (12 person-weeks) to the US project at his customary daily rate of US\$240. The figures for years 2 and 3 have been increased by five per cent per year. Additional financial support for his efforts will be provided from UK funding.

#### **M. Cost Sharing**

The Boston College Department of Economics will fund the tuition remission credits required to fully support the academic progress of the two graduate students hired under this project, contingent upon their satisfactory progress toward the Ph.D. degree as defined in departmental regulations.

## Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

|   |   |  |  |
|---|---|--|--|
| The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.  |   |  |  |
| Investigator: <b>Christopher Baum</b>   | Other agencies (including NSF) to which this proposal has been/will be submitted. |  |  |
| Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title: <b>Interdisciplinary Minor in Scientific Computation</b>                  |   |  |  |
| Source of Support: <b>Boston College internal Teaching Grant</b><br>Total Award Amount: \$ <b>2,500</b> Total Award Period Covered: <b>06/01/99 - 08/31/99</b><br>Location of Project: <b>Boston College</b><br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr: <b>0.50</b> |   |  |  |
| Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title: <b>Economics Distributed Electronic Library</b>                           |   |  |  |
| Source of Support: <b>National Science Foundation</b><br>Total Award Amount: \$ <b>356,319</b> Total Award Period Covered: <b>06/01/99 - 05/31/01</b><br>Location of Project: <b>Boston College</b><br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr: <b>2.00</b>          |   |  |  |
| Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title:  |   |  |  |
| Source of Support:<br>Total Award Amount: \$   Total Award Period Covered:<br>Location of Project:<br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr:   |   |  |  |
| Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title:  |   |  |  |
| Source of Support:<br>Total Award Amount: \$   Total Award Period Covered:<br>Location of Project:<br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr:   |   |  |  |
| Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title:  |   |  |  |
| Source of Support:<br>Total Award Amount: \$   Total Award Period Covered:<br>Location of Project:<br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr:   |   |  |  |

\*If this project has previously been funded by another agency, please list and furnish information for immediately preceding period.

## Current and Pending Support

(See GPG Section II.D.8 for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

|   |   |
|---|---|
| Investigator: <b>Thomas Krichel</b>   | Other agencies (including NSF) to which this proposal has been/will be submitted. |
| Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title: <b>WoPEC: Working Papers in Economics</b>                                   |   |
| Source of Support: <b>Joint Information Systems Committee</b><br>Total Award Amount: \$ <b>79,200</b> Total Award Period Covered: <b>08/01/98 - 07/31/99</b><br>Location of Project: <b>University of Surrey</b><br>Person-Months Per Year Committed to the Project.   Cal: <b>3.00</b> Acad:   Sumr: |   |
| Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title:  |   |
| Source of Support:<br>Total Award Amount: \$   Total Award Period Covered:<br>Location of Project:<br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr:   |   |
| Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title:  |   |
| Source of Support:<br>Total Award Amount: \$   Total Award Period Covered:<br>Location of Project:<br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr:   |   |
| Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title:  |   |
| Source of Support:<br>Total Award Amount: \$   Total Award Period Covered:<br>Location of Project:<br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr:   |   |
| Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support<br>Project/Proposal Title:  |   |
| Source of Support:<br>Total Award Amount: \$   Total Award Period Covered:<br>Location of Project:<br>Person-Months Per Year Committed to the Project.   Cal:   Acad:   Sumr:   |   |

\*If this project has previously been funded by another agency, please list and furnish information for immediately preceding period.

# EDEL: Economics Distributed Electronic Library

## Facilities, Equipment, and Other Resources

January 1999

### **Computer:**

The EDEL collaborative project will make use of computer equipment in both the US and UK sites. Computing facilities at Boston College, including the UNIX (IBM RS/6000) system `fmrisc.bc.edu`, managed by Christopher F. Baum, will store mirrored copies of all development materials involved with the project. The sole equipment request for the project is for an additional disk drive for this system (which is equipped with a disk tower) which will be dedicated to EDEL. Other resources provided by Information Technology at Boston College will be used to ensure security for the project materials. BCIT is responsible for remote backup and off-site storage of all filesystems on `fmrisc.bc.edu`, provides technical assistance for the maintenance of system software and compilers, and funds a service agreement with IBM providing next-day response for any hardware maintenance needs.

Public access to materials developed by the project will be made accessible through facilities on three separate computer systems donated by other institutions.

Through prior JISC funding in the UK, the RePEc project owns 9 gigabytes of disk space on a Cray superserver at the Manchester Computing Centre. This machine is to be phased out during the second year of the project but Manchester Computing Centre will provide the equivalent disk space on their successor machine.

In Japan, the project's public user interface will use a HP workstation, the use of which is donated to the RePEc project by Hitotsubashi University, Tokyo.

In the US the project's public user interface will initially be based on a Sun workstation at Washington University of St. Louis. These facilities may be moved to a machine at Boston College.

### **Office:**

The Boston College Department of Economics will provide workspace for the graduate research assistants hired under this proposal. This includes access to desktop workstations networked to `fmrisc.bc.edu` and the Internet with appropriate tools for the handling of project data.

Appropriate office space, secretarial and budget management support will be available to Christopher F. Baum by virtue of his continuing status as a full-time faculty member of the Department of Economics throughout the proposal period.

Office space for the UK based work will be donated by the Library and the Department of Economics at the University of Surrey.