

Assessment report
Limited Programme Assessment

Bachelor Econometrics and Operations Research

Vrije Universiteit Amsterdam

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1. Executive summary

In this executive summary, the panel presents the main considerations which have led to the assessment of the quality of the programme Bachelor Econometrics and Operations Research of Vrije Universiteit Amsterdam, which has been assessed according to the NVAO Assessment Framework.

The panel observes programme management has taken up the recommendations made in the previous assessment in 2009. Programme management has, among others, introduced the binding study advice in the first year, introduced the course *Ethics*, replaced 3.0 EC courses by 6.0 EC courses to increase study success rates and improved the assessment process of the bachelor thesis.

The panel is positive about the Faculty's objectives to educate students not only in academic and professional knowledge and skills but also to train them to become responsibly thinking and acting professionals or academics. The latter is a distinct and valuable characteristic of the Vrije Universiteit economics programmes. The objectives of the programme include preparing students for quantitative master programmes in the econometrics, business administration or economics domains as well as enabling them to enter the labour market, be it that most students opt for the former career path. The panel is positive about the programme, allowing students to gain extensive knowledge of the econometrics domain, to deepen their understanding of one of the econometrics subdomains and to acquire academic and research skills.

The programme intended learning outcomes reflect these objectives and include disciplinary knowledge, academic skills, research skills and societal awareness. The intended learning outcomes are consistent with the domain-specific reference framework, which has been drafted by this Faculty and the economics programmes of Erasmus University Rotterdam and Wageningen University, and correspond to the requirements of a bachelor level programme.

Programme management conducted a sound comparison to other econometrics bachelor programmes. The profile of this programme as a programme with a strong theoretical and practical informatics component is evident.

The panel advises programme management to continue the efforts to intensify the relations with the professional field, to inform students about career perspectives.

In the panel's opinion, the admission requirements and the admission processes, such as the matching procedures, are adequate, including informing applicants about the challenging nature of the programme.

The curriculum reflects all of the intended learning outcomes adequately and evenly. The panel regards the curriculum to be very well designed, well balanced and effective in teaching students the theoretical and practical dimensions of econometrics. Students are introduced to the specialisations econometrics, operations research and mathematical economics in this discipline and may deepen their knowledge and skills in one of these. Students are also adequately taught academic and research skills. The panel noted corresponding views on the principles governing the curriculum among the Faculty Board, programme management, lecturers and students and regards this to be effective for the quality of the programme.

The educational principles and the study methods of the programme promote the students' active participation in the learning processes. The policies regarding introducing new and innovative study methods are satisfactory. The panel feels programme management has taken important steps to raise the student success rates and encourages programme management to continue along this path.

The lecturers deployment and evaluation procedures ensure qualified lecturers to teach in the programme. The panel regards the lecturers to be eminent researchers and to be very good lecturers. The panel is equally positive about their interaction with students, which may be regarded as intensive and effective, and about the system of study guidance.

The panel approves of the examination and assessment rules and regulations of the programme. They conform to the Vrije Universiteit and Faculty of Economics and Business Administration policy statements and include, among others, measures to assure the examinations' validity, the reliability of assessments and the competencies and expertise of examiners.

The examination methods in the programme are in line with the course contents to be assessed. The diversity of examination methods in courses and across courses allows for the assessment of knowledge and skills, relevant to the programme. Multiple-choice examinations may be part of examinations of courses, but never are the sole examination method in a course.

The panel observes programme management having drafted a comprehensive thesis manual, in which the timeline of the thesis writing process has been explained clearly. The supervision of the thesis is well organised, including regular meetings of students and supervisors to discuss the intermediate and final products and for students to obtain feedback on their thesis. The thesis assessment process is a reliable process, as at least two examiners are involved and sound assessment forms are used. The panel welcomes the transition process from assessment forms to scoring models or rubrics, as these may raise the quality of the assessments further.

The panel ascertained the Examination Board to have the responsibilities and to work along the lines, as intended by Dutch applicable law. The Board monitors the examination and assessment processes and inspects examinations. The panel recommends to step up these inspections and to include theses in the quality assurance checks, as the Examination Board plans to do.

The examinations of courses in the programme are regarded by the panel to be of adequate quality and an appropriate level, meeting the courses' learning goals and to be of a challenging nature.

All of the theses the panel studied, have been assessed by the panel to be at least satisfactory and some of them very good. The panel regards the grades, given by the examiners to be systematically somewhat too low. The panel would have given somewhat higher grades for the theses. Taking this observation into account, the panel would rate the theses to have an average grade of about 8.0.

The panel assesses the programme Bachelor Econometrics and Operations Research of Vrije Universiteit Amsterdam to be good and recommends NVAO to grant re-accreditation to this programme.

Rotterdam, 6 March 2017

Panel chair
Prof. dr. T.J. Wansbeek

Secretary
drs. W. Vercouteren RC

2. Assessment process

Certiked VBI received a request to conduct a limited programme assessment for the re-accreditation of the academic degree programme Bachelor Econometrics and Operations Research. This request was submitted by Vrije Universiteit Amsterdam.

Certiked requested the approval by NVAO of the proposed panel of experts to conduct this assessment. NVAO have given their approval. The panel composition was as follows (for more detailed information please refer to Annex 4: Assessment panel composition):

- Prof. dr. T.J. Wansbeek, Emeritus Professor of Statistics and Econometrics, University of Groningen (panel chair);
- Prof. dr. J. Hartog, Emeritus Professor of Microeconomics with visiting scholar position, University of Amsterdam (panel member);
- Prof. dr. R. Kabir, Professor and Chair of Corporate Finance and Risk Management, University of Twente (panel member);
- S.M. van den Hoek, student Bachelor programme Tax Economics, University of Amsterdam (student member).

On behalf of Certiked, drs. W. Vercouteren RC was responsible for the process coordination and for drafting the panel's report. All panel members and the secretary signed a statement of independence and confidentiality.

The panel conducted this assessment on the basis of the NVAO Assessment Framework of 19 December 2014 (Staatscourant nr. 36791). Regarding the selection of the theses, the panel proceeded in line with the NVAO Guidelines for the assessment of final projects during external assessments of 18 February 2015. On 19 September 2016, NVAO determined the number of theses to be studied by the panel in this particular case.

The following procedure was adopted. The panel members of the panel studied the documents presented beforehand by programme management, including a number of theses (please refer to Annex 2 and 3: Documents reviewed and Theses reviewed).

Before the date of the site visit, the panel chair and the panel secretary met to discuss the assessment procedures. On 9 November 2016, the panel had a meeting to discuss the preliminary findings concerning the quality of the programme. Beforehand, the panel members had sent a number of questions to be put to the programme representatives during the site visit.

During the meeting on 9 November 2016, the findings of the panel members, including those concerning the theses, were discussed. On the basis of the input of the panel, the secretary summarised the questions, which served as a starting point for the discussions with the programme representatives during the site visit.

On 10 November 2016 and 11 November 2016, the panel conducted the site visit on the Vrije Universiteit Amsterdam campus. The site visit was conducted in accordance with the schedule drawn up beforehand (please refer to Annex 1: Site visit schedule). Prior to the site visit, programme management communicated the open office hours to the students in the programme and the staff. No one called on the panel.

A draft version of this report was finalised by the secretary, having taken into account the information presented as well as the findings and considerations of the panel. The panel members studied the draft report and made a number of changes. Thereupon, the secretary drew up the final report. This report was presented to programme management to be corrected for factual inaccuracies. After having been corrected for these factual inaccuracies, the report was sent to the institution's Board to accompany their request for re-accreditation.

3. Overview of the programme

3.1 Basic information about the programme

Administrative information about the programme:

Name programme in CROHO: Bachelor Econometrics and Operations Research
 Orientation, level programme: Academic Bachelor
 Grade: BSc
 Number of credits: 180.0 EC
 Specialisations: N.A.
 Location: Amsterdam
 Mode of study: Full-time
 Registration in CROHO: 56833

Administrative information about the institution:

Name of institution: Vrije Universiteit Amsterdam
 Status of institution: Government-funded university
 Institution's quality assurance: Approved

Quantitative data about the programme

Cumulative proportion of students who dropped out after one, two or three years (vwo matriculation)

Cohort	2010	2011	2012	2013	2014
Drop-out rate after one year	39 %	35 %	37 %	44 %	24 %
Drop-out rate after two years	52 %	48 %	51 %	52 %	
Drop-out rate after three years	54 %	48 %	52 %		

Cumulative proportion of students who continued their study in the second year and who completed the programme after three, four, five and six or more years (vwo matriculation)

Cohort	2010	2011	2012	2013	2014
Success rate after three years	11 %	37 %	12 %		
Success rate after four years	51 %	66 %			
Success rate after five years	59 %				
Success rate after six or more years					

Percentage of students who continued their studies in the second year and who completed the programme after three, four, five and six or more years (all students)

Cohort	2010	2011	2012	2013	2014
Success rate after three years	12 %	36 %	12 %		
Success rate after four years	51 %	64 %			
Success rate after five years	60 %				
Success rate after six or more years					

Lecturers' qualifications

Qualification	MSc	PhD	BKO*
Percentage of lecturers	100 %	90 %	51 %

*BKO means having obtained Dutch University Teaching Qualification.

The student-to-staff ratio is 42 : 1 (study year 2015 – 2016)

Number of contact hours per week for each of the years of the programme

Year of the programme	Year 1	Year 2	Year 3
Number of contact hours per week	14	12	11*

*Contact hours have been calculated as (51 EC/60 EC x 12 hours per week (courses) + 9 EC/60 EC x 4 hours per week (thesis individual supervision and thesis group meetings))

3.2 Main facts about the institution

The degree programme Bachelor Econometrics and Operations Research is a programme of the Faculty of Economics and Business Administration of Vrije Universiteit Amsterdam.

Vrije Universiteit Amsterdam (VU) was founded in 1880. According to the website, the university aspires to be an open organisation, strongly linked to people and society. For the University, what matters is not just the acquisition of a greater depth of knowledge, but also the pursuit of a wider scope. VU expects students, researchers, PhD candidates and employees to look beyond their own interests and their own field.

The aim of Vrije Universiteit Amsterdam is to offer academic research and education at a high level of ambition, and to encourage free and open ideas and communication. In its own words, VU stands for universal university values such as academic freedom and independence. The basic philosophy of the university is expressed in three core values: responsibility, openness and personal engagement.

The Faculties of Vrije Universiteit Amsterdam are the Faculties of Dentistry, Earth and Life Sciences, Economics and Business Administration, Behavioural and Movement Sciences, Humanities, Law, Medicine, Sciences, Social Sciences and Theology. Nearly 25,000 students are enrolled in the programmes of the university. About 10,000 staff is employed by the university and by the affiliated VU Medical Center.

The Faculty of Economics and Business Administration offers four bachelor programmes, seven master programmes and 17 postgraduate programmes. Approximately 4,000 bachelor and master students and about 1,700 postgraduate students study at the Faculty and over 500 academic and non-academic staff are employed by the Faculty. The Faculty of Economics and Business Administration is the largest faculty of Vrije Universiteit Amsterdam.

In 2012, the Faculty of Economics and Business Administration started the process of reorganising all of the bachelor and master programmes, beginning with the bachelor programmes. The objectives of this process were to raise the quality of the programmes. Measures which have been taken, are more strict selection of incoming students, raising the education capabilities of the lecturers, restating the intended learning outcomes of the programmes and redesigning the curricula. In 2014, the Faculty offered these reorganised bachelor programmes for the first time.

At the time of this assessment process, the first two years of the bachelor programmes had been renewed, whereas the third and last year still was traditionally organised. The master programmes had not yet been renewed but will, in the coming years, starting in 2017, follow the bachelor programmes. The panel has taken this process of transition into account, when assessing this and the other programmes of the Faculty.

3.3 Intended learning outcomes

The intended learning outcomes of the programme are as follows.

- Students have mastered the use of computers, including knowledge of an advanced programming language and knowledge of some mathematical/econometric software packages.
- Students have received an initial introduction to independently examining reference works in the discipline, have acquired research skills and have demonstrated that they are competent in this field.
- Students have a thorough basic understanding of mathematics and statistics.
- Students have thorough knowledge of the three core areas in econometrics: operations research, mathematical economics and econometrics, adequate to pursue successfully a master programme in econometrics & operations research or in a related field.
- Students are able to model business and other economics problems and to apply analytical methods from mathematics and statistics. Students are aware of the employment options after completing the course of study with a bachelor's degree.
- Students can operate on teams and have good written and oral communication skills.
- Students have an understanding of the coherence between sciences and are aware of the role this discipline has in other scientific fields, such as economics, and in society.
- Students understand the various specialisations adequately to make an informed selection among the quantitative advanced programmes of study.

3.4 Outline of the curriculum

In the table below, the programme curriculum is presented (the new curriculum is shown for the first two years, whereas for the third year the traditional curriculum is shown, since the new curriculum will only commence in 2016 – 2017).

Courses	Credits
Analysis I	6.0 EC
Colloquium I	0.0 EC
Introduction to Programming (Java)	6.0 EC
Linear Algebra I	6.0 EC
Probability Theory	6.0 EC
Introduction to Econometrics, Operations Research and Mathematical Economics	6.0 EC
Macroeconomics I	6.0 EC
Analysis II	6.0 EC
Colloquium II	0.0 EC
Statistics	6.0 EC
Finance I	6.0 EC
Academic Skills: Probability and Inference	6.0 EC

First year	60.0 EC
Econometrics I	6.0 EC
Mathematical Economics I	6.0 EC
Operations Research I	6.0 EC
Numerical Methods	6.0 EC
Integrative Practical	6.0 EC
Econometrics II	6.0 EC
Mathematical Economics II	6.0 EC
Operations Research II	6.0 EC
Ethics	6.0 EC
Advanced Practical	6.0 EC
Second year	60.0 EC
Econometrics I	3.0 EC
Business Econometrics I	3.0 EC
Stochastic Operations Research I	3.0 EC
Mathematical Economics I: Game Theory	3.0 EC
Essay	3.0 EC
Philosophy of Economics	3.0 EC
Philosophy II	3.0 EC
Major Econometrics and Mathematical Economics or Major Operations Research and Business Econometrics	9.0 EC
Electives	21.0 EC
Bachelor Thesis	9.0 EC
Third year*	60.0 EC
Total credits of the programme	180.0 EC

*In the reorganised curriculum, the third year, to be offered from 2016 – 2017 onwards, will be composed of a minor (30.0 EC), courses Econometrics III, Mathematical Economics III or Operations Research III (6.0 EC), two electives (12.0 EC) and the Bachelor Thesis (12.0).

4. Overview of assessments

Standard	Assessment
Standard 1. Intended learning outcomes	Satisfactory
Standard 2: Teaching-learning environment	Good
Standard 3: Assessment	Satisfactory
Standard 4: Achieved learning outcomes	Good
Programme	Good

5. Findings, considerations and assessments per standard

5.1 Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to contents, level and orientation; they meet international requirements.

Findings

As the Dean of the Faculty of Economics and Business Administration explained to the panel, the main objectives of the Faculty are not only to train students to become experts in their field, but also to educate students to handle subjects and problems in a responsible way. So, students are not only trained content-wise but also with respect to their attitudes. These objectives are condensed in the values expressed in the Vrije Universiteit's mission statement, namely responsibility, openness and personal engagement. These values have been translated into the main objectives of the programme, which are to train students as academics, professionals and citizens.

In preparation of this external assessment, the Faculty of Economics and Business Administration of Vrije Universiteit in collaboration with the management of the economics programmes of Erasmus University Rotterdam and Wageningen University updated the domain-specific reference framework for Economics. The current reference framework is an update on a number of non-essential points of the 2009 edition, which was approved by the Deans of all Economics Faculties in the Netherlands. The major change has been the removal of sections referring to business administration.

The programme objectives are to prepare students for Dutch or international master programmes in the domains of econometrics, business administration or economics, with a strong, quantitative orientation and to train them for positions in the labour market. Most students tend to opt for continuing their studies at master level. The programme is a programme, meant to train students in the theoretical and practical aspects of mathematics, statistics, informatics, economics and econometrics. In addition, students are educated in academic and research skills.

Programme management drafted the intended learning outcomes of the programme. These intended learning outcomes are consistent with the Faculty-wide learning outcomes for bachelor programmes, which specify academic skills, research skills, quantitative skills, disciplinary knowledge, professional skills, social competencies, societal and contextual awareness and self-awareness. These have been tailored to the specifics of this Econometrics and Operations Research bachelor programme.

The intended learning outcomes of the programme have been compared to bachelor programmes in econometrics and operations research in the Netherlands. Programmes, which have been considered in this respect, are programmes of Erasmus University Rotterdam, University of Amsterdam, University of Groningen and Tilburg University. Abroad, no econometrics programmes are offered. From the comparison, this programme emerges as a programme distinguishing itself by a relatively pronounced theoretical and practical informatics component.

Programme management drafted a table, to show the correspondence of the intended learning outcomes of the programme to the Dublin-descriptors for bachelor programmes. From this table, it may be deduced the programme intended learning outcomes match these Dublin-descriptors.

In order to keep in contact with trends in professional practice, an Advisory Board with representatives of the professional field has been installed. This Board advises on the programme, but also is instrumental in offering student internships. Programme management informs students about career chances. Students, with whom the panel met, called on programme management to strengthen the link with the professional field.

Considerations

The panel is positive about the Faculty of Economics and Business Administration objectives to train the students not only in terms of academic and professional knowledge and skills but to train them equally to become responsibly thinking and acting professionals or academics in the Economics field. The panel holds the opinion the latter to be a distinct and valuable characteristic of the Vrije Universiteit Economics programmes.

The panel welcomes the efforts of this Faculty and of the economics programmes of Erasmus University Rotterdam and of Wageningen University to update the 2009 domain-specific reference framework.

The panel supports the objectives of the programme, not only to prepare students for quantitative master programmes in the econometrics, business administration or economics domains, but also to enable them to enter the labour market, be it that most students opt for the former career path. The panel is positive about the programme, allowing students to gain broad knowledge of the econometrics domain, to acquire in-depth understanding of one of the econometrics subdomains and to be trained in academic and research skills.

The panel studied the intended learning outcomes of the programme and observes these to meet the programme objectives, exhibiting, among others, disciplinary knowledge, academic skills, research skills and societal awareness. In the panel's opinion, the programme learning outcomes are consistent with the domain-specific reference framework. The panel considers the intended learning outcomes of the programme preparing students adequately for master programmes in this domain as well as preparing students for the labour market.

In the panel's opinion, programme management conducted a sound comparison to other econometrics bachelor programmes in the Netherlands. The profile of this programme as a programme with a strong theoretical and practical informatics component is evident.

The panel ascertains the intended learning outcomes of the programme to match the Dublin-descriptors for bachelor programmes and, therefore, to meet the requirements of a bachelor level programme.

The panel advises programme management to continue the efforts to intensify the relations with the professional field, to inform students about career perspectives.

Assessment of this standard

These considerations have led the assessment panel to assess standard 1, *Intended learning outcomes* to be satisfactory.

5.2 Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Findings

The responsibility for the programmes of the Faculty of Economics and Business Administration rests with the Dean of the Faculty, and the Faculty Board. Programme management, being the programme director or, in the Faculty's larger programmes, the programme director assisted by the programme coordinator, is responsible for the organisation and the contents of the programme and for assuring and maintaining the quality thereof. Programme management is advised on the programme quality by the Programme Committee, composed of an equal number of lecturers and students. As will be elaborated under standard 3, an Examination Board has been put in place, monitoring the examinations and assessments of the programme.

The number of students enrolling in the programme remained more or less stable over the years, showing an influx of 71 students in 2010 via an influx of 74 in 2012 to an influx of 82 students in 2014. The vast majority of the students have as their previous education the Dutch *vwo-diploma*. The Faculty Board expressed as their goal to increase to a certain extent the market share of this bachelor programme.

The entry requirements for applicants are the Dutch *vwo-diploma*, with the required level of mathematics (Mathematics B1). Applicants older than 21 years, may take the *colloquium doctum* test.

In the first year, students have to pass the Dutch language test. The language of instruction in this bachelor programme is Dutch in the first two years, gradually changing to English in the second and third year. Programme management feels students are challenged enough as it is by the contents of the curriculum and ought to be offered the opportunity to gradually accommodate to English. Still, the language of instruction in bachelor programmes is being discussed among programme management and lecturers. All of the literature in the programme, is international literature, in English. About 15 % of the students spend part of the curriculum abroad.

Programme management presented a table in which the relations between the intended learning outcomes and the curriculum components have been specified. From this table, it may be deduced that all of the intended learning outcomes are addressed in one or more courses.

In the first year, students are taught the basic knowledge and skills on mathematics, statistics, economics and informatics. Mathematics are taught by lecturers of the Faculty of Sciences. In the second year, students are acquainted with the three specialisations within the econometrics domain, being econometrics, operations research and mathematical economics. Students not only are taught the theory of these subjects, but are also trained in practical applications, having to solve integrative cases in group assignments. In the third year, students may gain more in-depth knowledge and skills in one of the specialisations. In addition, students are trained in academic skills and research skills in courses, such as *Academic Skills*, *Philosophy* and *Ethics*.

In the elective's space, students may opt for an internship, which normally is 12.0 EC. About 20 % of the students do so. Prior to the internship, students are to submit an internship plan, which has to be approved. Internships will be approved, if the research component is satisfactory. Students are entitled to an internship supervisor. At completion of the internship, they are to submit an internship report.

The quality and the coherence of the curriculum are regularly discussed between the programme director and the course coordinators and among the course coordinators and the lecturers. The coherence of the curriculum is reinforced by the integration courses, just mentioned.

The educational principle of the programme is to promote students actively engaging in the learning processes, since this fosters their knowledge and skills acquisition. Study methods are lectures, tutorials, computer practical and practical integration courses. Students are encouraged to actively digest the subject matter of courses, working on cases and assignments, individually and in small groups. To promote the introduction of new, innovative study methods, the Faculty of Economics and Business Administration has set up the Innovation Center. Lecturers are encouraged to suggest new study methods and may be granted financial support by the Faculty to develop or test their method. All innovations will be presented in the Innovation Center, with the purpose of other lecturers being informed about these methods, seeing the benefits and adopting these in their own classes.

Programme management has taken a number of measures to raise the students' study pace and to increase the study success rates. Applicants are informed about the challenging level of mathematics in the curriculum and, in matching days, are tested on their knowledge and skills. In the first year, students are to report at least 42.0 EC. If they would fail to do so, they will have to leave the programme. The courses in the first year are very challenging, which contributes to the selection process among students in the beginning of the programme. Programme management intensified student guidance. The students with whom the panel met, expressed being very content about the study guidance. The proportion of students completing the programme in three years fluctuated largely from 12 % to 36 %, whereas the figure for completion in four years increased from 51 % to 64 % (figures for two cohorts).

Lecturers are employed as researchers in one of the departments of the Faculty and, occasionally, in departments outside of the Faculty. The programme director is responsible for the deployment of the lecturers, discussing this with the department head. In the deployment process, the research and/or professional track records of the lecturers are being taken into account. Underperformance by lecturers will be signalled by the programme director and the Programme Committee. Unfavourable scores in students evaluations may adversely affect tenure track prospects. About 39 lecturers are involved in the programme. No less than 90 % of them have obtained a PhD. Over 50 % of them is in possession of a BKO-certificate, testifying to their capabilities in education. The students with whom the panel met, described the lecturers as being very good and stimulating teachers and being approachable and helpful.

Considerations

In the panel's view, the admission requirements and the admission processes, such as the matching procedures, are appropriate for this programme. Programme management informs applicants adequately about the challenging nature of the programme.

The curriculum reflects all of the intended learning outcomes of the programme adequately and evenly. The panel regards the curriculum to be very well designed, well balanced and effective in teaching students the theoretical and practical dimensions of econometrics. Students are appropriately introduced to the specialisations econometrics, operations research and mathematical economics within this discipline and may deepen their knowledge and skills in one of these. Students are also appropriately taught academic and research skills. The panel noted corresponding views on the principles governing the curriculum among the Faculty Board, programme management, lecturers and students and regards this to be effective for the quality of the programme.

The panel approves of the educational principles and the study methods of the programme, as they indeed promote the students active participation in the learning processes. The policies regarding the introduction of new and innovative study methods are satisfactory.

The panel feels programme management has taken important steps to raise the student success rates and encourages programme management to continue along this path of, among others, student guidance.

The panel approves of the lecturers deployment and evaluation procedures, as these procedures ensure qualified lecturers to teach in the programme. The panel regards the lecturers to be very good researchers, working in the forefront of their field of expertise. In addition, the panel is especially positive about the educational capabilities of the lecturers, and their interaction with the students, which may be regarded as intensive and effective. In addition, the panel is equally positive about the system of study guidance, that is available to the students.

Assessment of this standard

These considerations have led the assessment panel to assess standard 2, *Teaching-learning environment* to be good.

5.3 Standard 3: Assessment

The programme has an adequate assessment system in place.

Findings

The examinations and assessments of this programme, as of all the other programmes of the Faculty of Economics and Business Administration, are governed by the Vrije Universiteit Assessment Policy, this being part of the VU Quality Assurance Handbook, as well as by the Faculty Assessment Policy, which has been derived from this VU Assessment Policy. The examination and assessment rules and regulations of this and the other programmes of the Faculty are in line with these University and Faculty policy statements.

For this programme as well as for each of the other Faculty of Economics and Business Administration programmes, rules and regulations for the examinations and assessments have been specified and have been implemented. Firstly, programme management drafted an assessment plan, in which the courses' learning objectives are shown to cover the programme intended learning outcomes. This plan allows to verify whether the examinations of the courses comply with the intended learning outcomes of the programme. Secondly, programme management took a number of measures to promote the validity, reliability and transparency of examinations and assessments. To enhance the validity of the examinations, each of the examinations is prepared by one of the lecturers and is presented to another lecturer for review. The examiners ensure examinations to meet the course objectives and to conform to the intended learning outcomes of the programme. To foster the reliability of the assessments, answer models are being used by the examiners. This way, a degree of objectivity is introduced in the assessments. To promote the transparency of the examinations, students may inspect the grading of their work and examiners will explain the grading to students upon request. Thirdly, programme management ensures the examiners to have adequate expertise and competencies to fulfil their tasks. To this effect, examiners are formally appointed by the Examination Board, following the recommendation of the programme director. Fourthly, the examination methods or assessment types of the courses are to be consistent with the courses' learning objectives and study methods. In the assessment plan, these examination methods have been listed. Examination methods include written examinations with open questions, multiple-choice examinations, individual assignments, presentations, individual papers, group papers and computer assignments. Colloquia are not graded but attendance is required to be allowed to take examinations in the courses *Econometrics*, *Operations Research* and *Mathematical Economics* and *Academic Skills*. In most of the courses, multiple examinations are to be taken by the students and the final grade of the courses is a composite grade, this being the weighed outcome of the grades of the course components.

At the end of the programme, students are required to complete their bachelor thesis. In the new curriculum, the number of credits for the thesis has been raised from 9.0 EC to 12.0 EC. Students are expected to be able to conduct a literature survey and are encouraged to do empirical research. For the bachelor thesis, programme management drafted a thesis manual. In this manual, the procedures and the timeline for the thesis have been stipulated. Students receive supervision of the thesis writing process by a supervisor, being a lecturer in the programme. In addition, a number of meetings with supervisors and fellow-students are scheduled, in which meetings thesis proposals, mid-term reports, draft theses and final theses are discussed. Students are required to submit their thesis and to present and defend the thesis. Theses are assessed by both the thesis supervisor and the second reader. These two examiners assess and grade the thesis independently and meet to arrive at the final grade. In case they cannot agree, the head of the department which the thesis subject refers to, will decide the grade. For the thesis assessment, the examiners make use of assessment forms, showing the criteria to be assessed. The programmes of the Faculty are in the transition process from these forms to scoring models or rubrics, specifying the assessment criteria and statements per criterion to support the grading. Theses are checked for plagiarism and plagiarism scores are mentioned on the assessment forms or scoring models.

For the programmes of the Faculty of Economics and Business Administration, two Examination Boards have been installed, one for all of the regular bachelor and master programmes of the Faculty and one for all of the accredited postgraduate programmes. As this programme is one of the regular bachelor and master programmes of the Faculty, the first mentioned Examination Board has the authority. The Examination Board consists of a number of members of the Faculty as well as an external expert on examinations and assessments. The Board monitors examinations and assessments processes, in accordance with the Faculty Regulations and Guidelines regarding Examinations. In addition, the Examination Board ensures examinations, including final examinations, to conform to quality standards. In recent years, the Board scheduled training sessions for examiners and analysed multiple-choice examinations. The Examination Board studies assessment plans to verify the contents thereof. In 2016 – 2017, written examinations with open questions are analysed as well. The Board inspects examinations on an at random basis and has the intention to inspect examinations and theses more systematically in the coming years.

Considerations

The panel is positive about the examination and assessment rules and regulations of the programme. These not only conform to the Vrije Universiteit and Faculty of Economics and Business Administration policy statements but also address subjects which are relevant for assuring the examinations and assessments quality. These rules and regulations include, among others, measures to assure the examinations' validity, the reliability of assessments and the competencies and expertise of examiners.

The panel approves of the examination methods, that programme management has selected. These are in line with the course contents to be assessed. The diversity of examination methods in courses and across courses allows for the assessment of both knowledge and skills, relevant to the programme. Multiple-choice examinations may be part of examinations of courses, but never are the sole examination method in a course.

Programme management drafted a comprehensive thesis manual, in which the timeline of the thesis writing process is explained clearly. The supervision and assessment of the thesis are well organised. The panel is positive about the regular meetings of students and supervisors to discuss the intermediate and final products and for students to obtain feedback on their thesis. The assessment of the theses is a reliable process, as at least two examiners are involved and sound assessment forms are used. The panel welcomes the transition process from assessment forms to scoring models or rubrics, as these may raise the quality of the assessments further.

The panel ascertained the Examination Board to have the responsibilities and to work along the lines, as intended by Dutch applicable law. The Board monitors the examination and assessment processes and inspects examinations. The panel welcomes the intentions of the Examination Board and recommends to step up these inspections and to include theses in the quality assurance checks.

Assessment of this standard

The considerations have led the assessment panel to assess standard 3, *Assessment* to be satisfactory.

5.4 Standard 4: Achieved learning outcomes

The programme demonstrates that the intended learning outcomes are achieved.

Findings

In the two most recent years, 2014 – 2015 and 2015 – 2016, the average grades for the bachelor theses as estimations for the learning outcomes achieved by the graduates, were 7.6 and 7.7. The majority of the theses was awarded grades of 7.5 or 8.0

As has been mentioned when discussing standard 1, most of the graduates of the programme do not enter the labour market, but proceed with their studies at master level. The proportion of graduates of the programme to continue their master in the Netherlands is about 90 %. Most of the graduates continue their studies at Vrije Universiteit master programmes, mostly the Master Econometrics and Operations Research. Most of the graduates complete their master programme within two years and more than 90 % of them within three years.

Considerations

The panel studied examinations of a number of courses in the programme. The panel establishes these examinations to be of adequate quality and to be of an appropriate level, meeting the courses' learning goals. The panel considers these examinations to be of a challenging nature.

The panel studied eight theses of students in the programme. All of the theses have been assessed to be at least satisfactory by the panel. The panel rated some of the theses to be very good. The panel regards the grades, given by the examiners for the theses to be systematically somewhat too low. The panel would have given higher grades for these bachelor theses. Taking this observation into account, the panel would rate the theses to have an average grade of about 8.0.

Assessment of this standard

The considerations have led the assessment panel to assess standard 4, *Achieved learning outcomes* to be good.

6. Recommendations

In this report, a number of recommendations have been listed. For the sake of clarity, these are brought together below. The recommendations are the following.

- To continue the efforts to intensify the relations with the professional field, to inform students about career perspectives.
- To continue the policy and measures by programme management, already in place, to raise the student success rates.
- To step up the inspections of examinations by the Examination Board and to include the theses in these quality assurance checks, as the Examination Board is planning to do.

Annex 1: Site visit schedule

The site visit was conducted in Amsterdam on 10 November 2016. On 11 November 2016, the panel met with the Examination Board.

Site visit schedule for 10 November 2016.

08.30 h. – 09.00 h.	Arrival and deliberations panel (closed session)
09.00 h. – 09.45 h.	Faculty Board Prof. dr. W. Verschoor (Dean of Faculty Economics and Business Administration), drs. R. de Crom (Faculty Director of Education), M. Eigenhuis (Student Assessor Faculty Board)
09.45 h. – 10.45 h.	Programme management Bachelor Econometrics and Operations Research Programme management Bachelor Econometrics and Operations Research Prof. dr. H. de Groot (programme director, Bachelor Econometrics and Operations Research), dr. M. Schauten (programme coordinator, Bachelor Econometrics and Operations Research), dr. R. Heijungs (associate professor, Bachelor Econometrics and Operations Research), prof. dr. B. Heidergott (programme director, Bachelor Econometrics and Operations Research), dr. C. Bos (programme coordinator, Bachelor Econometrics and Operations Research), dr. R. van den Brink (associate professor, Bachelor Econometrics and Operations Research)
11.00 h. – 12.00 h.	Lecturers and examiners Bachelor Econometrics and Operations Research Lecturers and examiners Bachelor Econometrics and Operations Research Dr. T. Budding (assistant professor, chair Programme Committee, Bachelor Econometrics and Operations Research), dr. H. Bloemen (associate professor, Bachelor Econometrics and Operations Research), prof. dr. M. Hofkes (Professor of Environmental Economics, Bachelor Econometrics and Operations Research), dr. H. Houba (associate professor, member Programme Committee, Bachelor Econometrics and Operations Research), dr. A. Estevez Fernandez (assistant professor, Bachelor Econometrics and Operations Research), dr. L. Hoogerheide (associate professor, Bachelor Econometrics and Operations Research)
12.00 h. – 12.45 h.	Students and alumni Bachelor Econometrics and Operations Research Students and alumni Bachelor Econometrics and Operations Research S. Plaul (second year student, member Programme Committee, Bachelor Econometrics and Operations Research), O. Papôt (third year student, Bachelor Econometrics and Operations Research), Q. Wiersma (third year student, Bachelor Econometrics and Operations Research), J. Koster (third year student, Bachelor Econometrics and Operations Research), E. Hoogenboom BSc (alumna, Bachelor Econometrics and Operations Research), J. Rutgers (first year student, member Programme Committee, Bachelor Econometrics and Operations Research), R. Rasiawan (second year student, member Programme Committee, Bachelor Econometrics and Operations Research), A. Mohazzab (second year student, Bachelor Econometrics and Operations Research), T. Dilaver MSc (alumnus, Bachelor Econometrics and Operations Research), R. Wulffraat BSc (alumnus, Bachelor Econometrics and Operations Research)

- 12.45 h. – 13.45 h. Lunch panel (closed session), open office hours 12.45 h. – 13.15 h.
- 13.45 h. – 14.45 h. Programme management Master Economics
Programme management Master Econometrics and Operations Research
Prof. dr. B. van der Klaauw (programme director, Master Economics), prof. dr. P. Gautier (Professor of Macro Labor Economics, Master Economics), prof. dr. M. Lindeboom (Professor of Economics, head of Department Economics, Master Economics), prof. dr. B. Heidergott (programme director, Master Econometrics and Operations Research), dr. R. van den Brink (associate professor, Master Econometrics and Operations Research), dr. A. Ridder (associate professor, Master Econometrics and Operations Research)
- 14.45 h. – 15.30 h. Lecturers and examiners Master Economics
Lecturers and examiners Master Econometrics and Operations Research
Dr. R. Oostendorp (Professor of International Economics, member Programme Committee, Master Economics), dr. S. Dobbelaere (associate professor Master Economics), prof. dr. J. Moraga Gonzales (Professor of Microeconomics. Master Economics), dr. ir. R. Sitters (assistant professor, Master Econometrics and Operations Research), dr. C. Bos (associate professor, Master Econometrics and Operations Research), dr. I. Lindner (associate professor, Master Econometrics and Operations Research)
- 15.45 h. – 16.15 h. Students and alumni Master Economics
Students and alumni Master Econometrics and Operations Research
N. Stoelinga MSc (alumna, Master Economics), A. Slavin BSc (student, member Programme Committee, Master Economics), M. Konings MSc (alumnus, Master Economics), N. Nguyen BSc (student, member Programme Committee, Master Econometrics and Operations Research), Y. Weesie BSc (student, Master Econometrics and Operations Research), J. van Brummelen BSc (student, Master Econometrics and Operations Research), K. Fontijn BSc (student, Master Econometrics and Operations Research), V. Rensink MSc (alumna, Master Econometrics and Operations Research), E. Blanken MSc (alumna, Master Econometrics and Operations Research)
- 16.15 h. – 17.30 h. Deliberations panel (closed session)
- Site visit schedule for 11 November 2016.
- 08.45 h. – 09.45 h. Examination Board regular bachelor programmes and master programmes
Examination Board postgraduate programmes
Prof. dr. B. van den Hooff (chair Examination Board regular programmes), prof. dr. H. van Herk (member Examination Board regular programmes), mr. drs. H. Welling (secretary Examination Board regular programmes), L. Spoor RA (chair Examination Board postgraduate programmes), prof. dr. F. Roozen (former chair Examination Board postgraduate programmes), B. de Graaff MSc (secretary Examination Board postgraduate programmes)

Annex 2: Documents reviewed

The panel studied the following documents, presented prior to the site visit

- Critical Reflection Report Limited Programme Assessment Bachelor Econometrics and Operations Research
- Redesign Faculty of Economics and Business Administration programmes
- Domain-specific frame of reference
- Intended learning outcomes
- Programme overview 2015 – 2016
- Course descriptions 2015 – 2016
- Assessment plan 2016 – 2017
- Thesis manual and assessment form 2015 – 2016
- Academic and Examination Regulations 2015 – 2016
- Rules and Regulations regarding examinations 2015 – 2016
- Overview of academic staff, including quality
- List of graduates in academic years 2014 – 2015 and 2015 – 2016
- Intake, drop out and success rates
- Staff/student ratio
- Average number of contact hours

On the day of the site visit, programme management presented the following documents

- Course material of a number of selected courses of the programme
- Examinations of a number of selected courses of the programme
- Internship manuals
- Internship reports
- Programme management annual reports
- Programme Committee annual reports
- Examination Board annual reports

Annex 3: Theses reviewed

The theses of the following eight students have been selected for review by the panel

- 2501544
- 2507860
- 2524417
- 2503028
- 2542739
- 2522105
- 2509409
- 2505734

Annex 4: Assessment panel composition

The assessment panel had the following composition:

- Prof. dr. T.J. Wansbeek, Emeritus Professor of Statistics and Econometrics, University of Groningen (panel chair);
- Prof. dr. J. Hartog, Emeritus Professor of Microeconomics with visiting scholar position, University of Amsterdam (panel member);
- Prof. dr. R. Kabir, Professor and Chair of Corporate Finance and Risk Management, University of Twente (panel member);
- S.M. van den Hoek, student Bachelor programme Tax Economics, University of Amsterdam (student member).

Prof. dr. T.J. Wansbeek, panel chair

Mr. Wansbeek is Emeritus Professor of Statistics and Econometrics at University of Groningen. He took his doctorate from University of Leiden. Among others, he held positions as Professor of Microeconomics at University of Amsterdam, as the Dean of the Faculty of Economics and Business of University of Amsterdam and as the Dean of the Faculty of Economics of University of Groningen. He was and is an editorial board member of a series of academic journals, such as *Journal of Econometrics*. Mr. Wansbeek held and holds a number of visiting scholar positions at, among others, University of Southern California, United States and Zhejiang University, China.

Prof. dr. J. Hartog, panel member

Mr. Hartog is Emeritus Professor of Microeconomics at University of Amsterdam, holding a visiting scholar position at this university. He took his doctorate from Erasmus University Rotterdam. At this university, he held the position of researcher and associate professor, subsequently becoming Professor of Microeconomics at University of Amsterdam. He held a number of visiting positions at universities in countries Europe, the United States and Asia. He also was an editor and referee for a number of international academic journals. Mr. Hartog is a member of the Royal Netherlands Academy of Sciences.

Prof. dr. R. Kabir, panel member

Mr. Kabir is Professor and Chair of Corporate Finance and Risk Management at University of Twente and Head of the Department of Finance and Accounting. He took his doctorate from Maastricht University. He held visiting scholar positions at, among others, Central University of Finance and Economics, Beijing, China, New York University, United States and University of Melbourne, Australia. Before becoming Professor at University of Twente, Mr. Kabir was Associate Professor of Finance at Tilburg University and Professor of Finance at University of Stirling, United Kingdom.

S.M. van den Hoek, student member

Ms. Van den Hoek is a student in the Bachelor programme Tax Economics of University of Amsterdam. She has taken on a number of extra-curricular activities, such as being the chair of the Student Association of her programme and being a member and the chair of the Student Council of the Faculty of Economics and Business of University of Amsterdam. In addition, Ms. Van den Hoek is employed by Canal Company as a guide and a host.