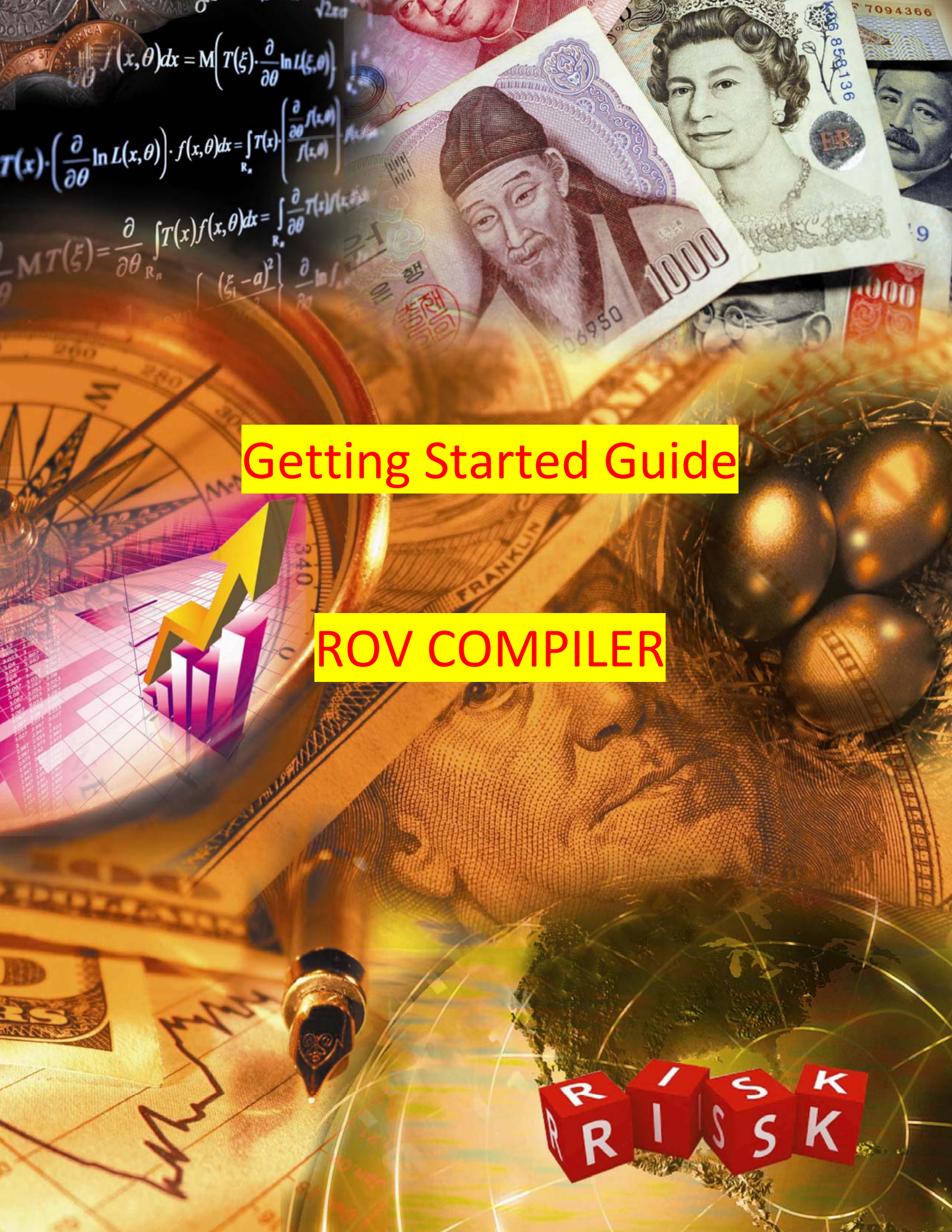




$$f(x, \theta) dx = M \left(T(\xi) \cdot \frac{\partial}{\partial \theta} \ln L(\xi, \theta) \right)$$
$$T(x) \cdot \left(\frac{\partial}{\partial \theta} \ln L(x, \theta) \right) \cdot f(x, \theta) dx = \int_{R_n} T(x) \cdot \left(\frac{\partial}{\partial \theta} \ln L(x, \theta) \right) \cdot f(x, \theta) dx$$
$$MT(\xi) = \frac{\partial}{\partial \theta} \int_{R_n} T(x) f(x, \theta) dx = \int_{R_n} \frac{\partial}{\partial \theta} T(x) f(x, \theta) dx$$
$$\left\{ \frac{(\xi_1 - a)^2}{2} \right\} \frac{\partial}{\partial \theta} \ln f(x, \theta)$$

Getting Started Guide

ROV COMPILER

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Introduction

This help file introduces the structure of ROV Compiler software, developed by Real Options Valuation, Inc. This software is meant to be used to convert Microsoft Excel XP, 2003 and 2007 files to extract an existing model into pure mathematical relationships and code such that the same model can be used as usual but the intellectual property of the model is protected. You can now use Excel as a software development tool instead of only a modeling tool. That is, suppose you are an expert in a certain industry like pharmaceutical, biotechnology, manufacturing, banking, insurance, aeronautics, and so forth, and further suppose that you have developed Excel models and worksheets that are appropriate for use by others in the same field. You can now use ROV Compiler to create executable EXE files from your existing Excel models, lock up the mathematical and computational logic into binary code and create extremely secure hardware-locked license protection of your file and distribute it like a software program. The compiled file when run will have the exact look and feel of Excel, minus the ability of accessing critical calculation logic, plus the ability to be secured and licensed like a regular software program. There exists public domain software that will crack Excel passwords quickly and effortlessly, but these crack software will not work on compiled files. By running the extracted model, several items are accomplished, namely:

- Any existing Excel 2002, 2003, 2007 files and beyond can be compiled—extracted from Excel XLS or XLSX files and turned into binary mathematical code and the file will become a self-executable EXE file—that when run, will open in Excel. The file will function exactly like an Excel file, with all of the Excel functionalities but the end-user will not have access to the calculations, functions or logic. It will look and feel like Excel but the computations are all embedded in binary format that is encrypted and not accessible to the end-user.
- All of the business intelligence and relationships are maintained but will no longer be visible to the end-user, allowing the model creator to safely and securely distribute the model without losing control of any intellectual property or company secrets.
- The compiled model can be locked using an AES 256 encryption (military strength protection) and can only be accessible using the correct password and license (using computer hardware locking algorithms).
- The compiled model cannot be changed by the end user and this maintains a strict quality control and prevents malicious tampering or accidental breakage of the model (e.g., equations and functions with broken links, wrong functions and calculations, etc).
- The compiled file can also be used by third-party software applications in a Component Based Modeling environment. For instance, the end user might have his or her own software or database with predefined calculations. The compiled file is linked into and is a part of this existing proprietary system. This proprietary system simply obtains the inputs to link into the compiled file and the compiled model will perform the computations and return the required outputs.

Please use the ROV Extractor and Evaluator software instead, also developed by Real Options Valuation, Inc., if you wish to extract the model into a file that runs completely *outside* of Excel (extracted into EXP files) where all of its calculations are hidden and protected. This ROV Extractor and Evaluator software complements the ROV Compiler software such that a large model that can take a long time to run in Excel can now be run at extremely fast speed in the lifted EXP model. Large scale Monte Carlo Risk Simulations with large number of trials can be performed at very high speed. Large models with many irrelevant parts are identified and additionally, you can identify the main key inputs and outputs you wish to have modeled. For instance, in a model such as $A+B+C=D$, $B+E=F$, and if F is chosen as the key output, only B and E are relevant. This decreases the computational time for the model by identifying critical inputs, and the model can then be optimized to run even faster once the model thread is identified. The large Excel model can now be turned into a calculator-like environment, where all the end user has to do is enter in the inputs and obtain the outputs. Imagine it as akin to creating a very large Visual Basic function in Excel, but instead of a simple function with several lines of computations, this function is an entire Excel workbook with many interconnected worksheets.

System Requirements

This software can be run in any Windows or MAC environment (MAC operating systems require Parallels or Virtual Machine to emulate a Windows environment), and is compatible with Microsoft Excel as well as other ODBC compliant databases and data files. The software suite requires 30MB of free disk space and recommended minimum 1GB of RAM for best performance.

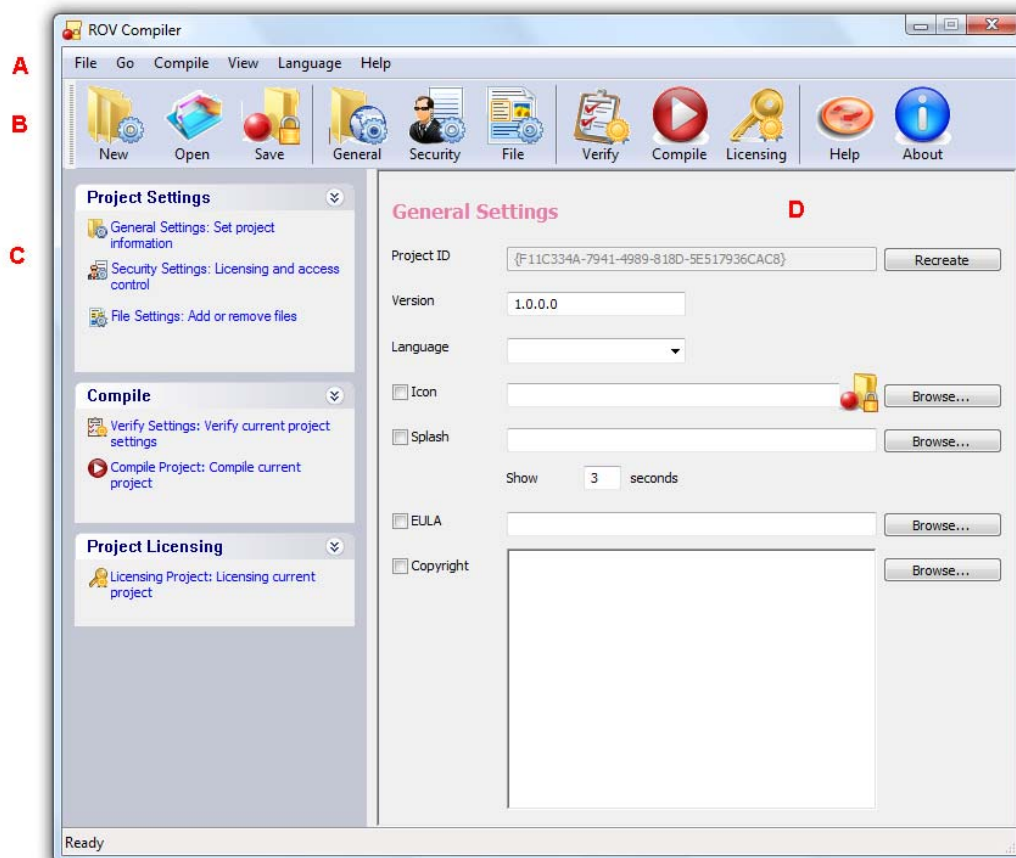
Copyright and Contact Information

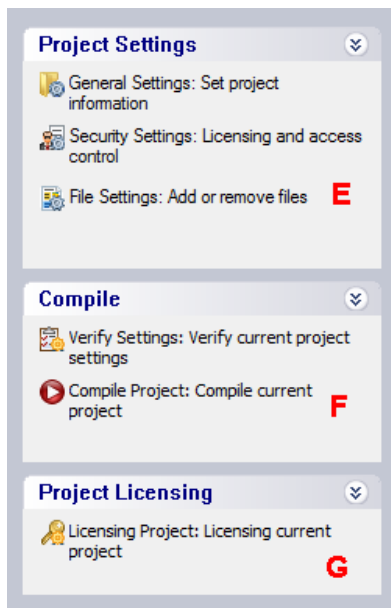
The ROV Compiler software was developed by Real Options Valuation, Inc. Copyright 2008-2009 by Dr. Johnathan Mun. All rights reserved. This program is protected by U.S. copyright laws and international treaties. Unauthorized reproduction or distribution of this program in its entirety, or any portion of it, will result in severe criminal and civil penalties, and will be prosecuted to the maximum extent of the law. The contact information for this software's developer is:

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ROV Compiler

When you start the ROV Compiler software, you will see a user interface as shown below. Briefly, the software interface has a menu bar **[A]**, whose functions are also accessible via the icons **[B]**. In addition, there are Project Settings navigation steps **[C]**, which are essentially the steps you would have to take in order to properly compile your Excel file. In each of the steps, a work area will be available for you to input your requirements for the compiled file **[D]**.





Typically, to compile an Excel file to its binary codes and make it executable within an Excel environment, there are several project settings that are required. These include the General Settings, Security Settings and File Settings [E]. Here you set up the compiled EXE file's information such as project ID, icon file, splash screen graphics, copyright information, end-user license information, software version, and language for ROV Compiler (the software supports multiple languages for its user interface and you can change the language of the software here). You can then continue to set up the security and file settings, the location and files to compile as well as verify if the settings are correct [F], and proceed to create license keys for the end-user [G]. You can control how long these license keys are effective for (number of uses, number of days, permanent or trial) as well as provide additional advanced hardware locking capabilities where the license key issued will only work on specific computers. The following sections illustrate the details of these settings.

QUICK PROCEDURES FOR COMPILING A FILE

The steps required to create an ROV Compiled file are very simple. You simply go through the Project Settings List sequentially. That is, you perform the following actions:

1. **New Project**
2. **General Settings**
3. **Security Settings**
4. **File Settings**
5. **Verify Settings**
6. **Compile Project**
7. **License Project**

TIP: Creating a New Project

To create a new project, simply click on FILE | NEW menu [A] or click on the NEW [B] icon or use the keyboard shortcut CTRL+N. This will start a new project with the file name Untitled. You are now ready to create your new project by going to the General Settings [E] tab.

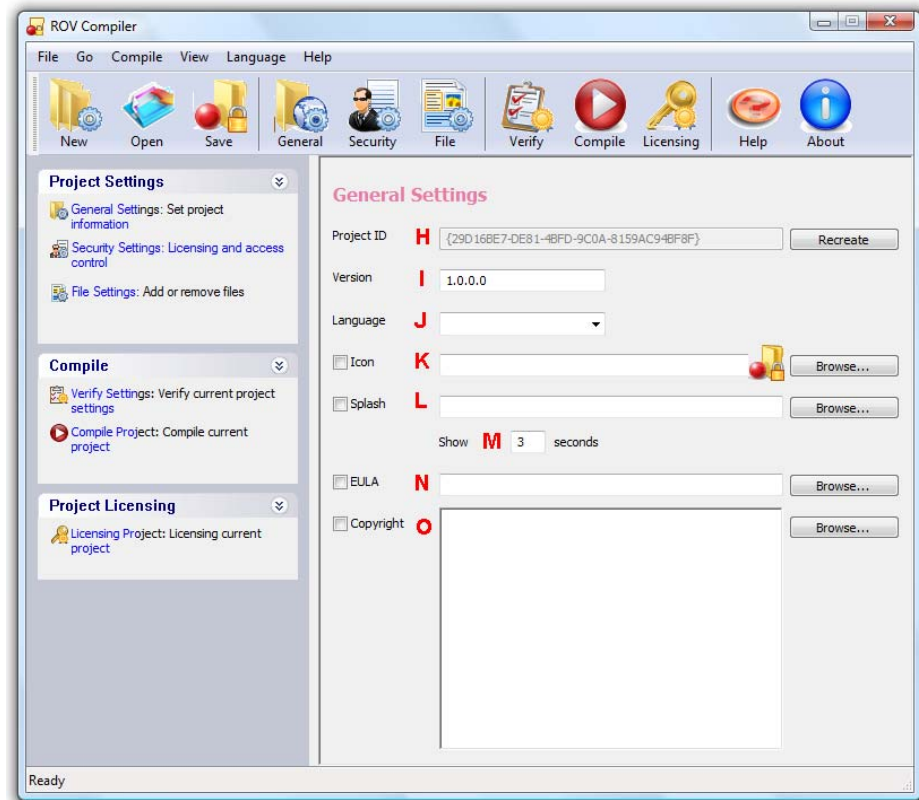
TIP: Save Settings

As you setup or create new settings, sometimes you may wish to reuse the same settings. For example, suppose you compile several Excel models with some encryption template for its licensing control, you may wish to use the same license control in the future for additional files, such that the same license key is usable for these newly compiled files, make sure you perform a FILE | SAVE before you close the software. These settings will be saved for future retrieval.

General Settings

To get started, you should begin with the General Settings tab, where you can set your newly created software's general settings. Here are the details of each element in General Settings:

- **Project ID [H]:** This is an alphanumeric sequence automatically generated by the software to identify your project, and does not impact your project, and is only required in the software's internal algorithms. You may simply ignore this value or click RECREATE to generate a new value. For added protection, this identification is used in ROV Compiler's algorithms when creating license keys, coupled with the encryption template and hardware identification (see the section on Licensing Project for more details).
- **Version [I]:** The format is X.X.X.X and only accepts positive integers, indicating the version number of your compiled EXE file. For instance, you may create new upgrades in the future of your compiled EXE software and may wish to provide each version its own number for easy identification.
- **Language [J]:** This is a drop down list for setting the target EXE's language.
- **Icon [K]:** This is the target EXE's default icon. That is, after you create the EXE file, the file will show this icon. You can retrieve icons from any ICO, DLL or EXE files and you can click on BROWSE button to look for the relevant file to use.
- **Splash [L]:** This is the compiled EXE's splash screen, that is, when the EXE is launched, this splash screen will appear momentarily before the EXE opens in Excel. You can put your company logo, company information and software information on the splash screen if required. You can click on BROWSE to open any GIF, JPG or BMP image file.
- **Show Seconds [M]:** The duration value can be set anywhere from 0 to 10 seconds, that is, you can decide on how long you wish to show the splash screen.
- **EULA [N]:** If you are creating a software program, we suggest also adding an End-User License Agreement (EULA). You can click on the BROWSE button to open any RTF or TEXT files. These files may be in different foreign languages as long as it is in UNICODE format.
- **COPYRIGHT [O]:** Finally, you can also include an optional Copyright text. A typical sample copyright text is shown in the figure. You can type in your copyright notice directly or click on BROWSE to open a TEXT file.

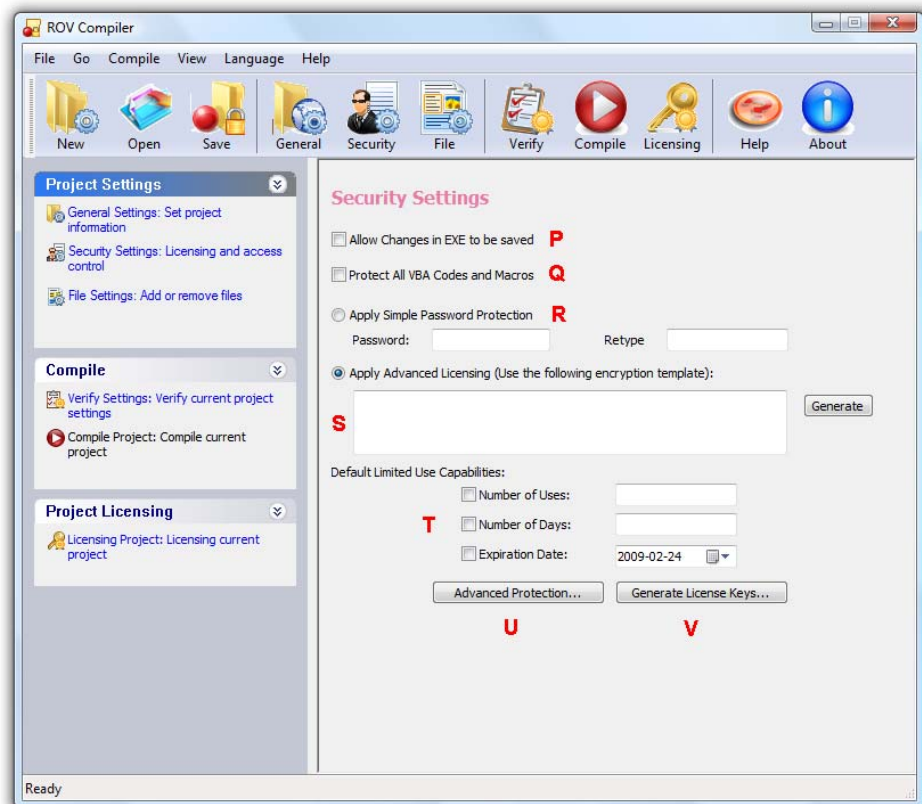


Security Settings

The next step is to set up the Security Settings. Specifically, you can decide if you would allow the end user of the compiled executable file to **SAVE CHANGES [P]** made subsequent to the end user's changes. If this selection is unchecked, the end user cannot save the changes made to the executable file. Next, you can decide if you wish to **Protect All VBA Codes and Macros [Q]** in your Excel file. If you check this selection, the end user will be unable to view the VBA codes as these will be extracted and compiled into binary code and be inaccessible by the end user. Next, you can also apply a **Simple Password [R]** protection versus applying more **Advanced Licensing [S]** protection. Typically, if the compiled file is used internally in an organization, a password is sufficient, whereas more advanced protection is warranted if you are creating your own software application. If the advanced licensing option is selected, you can also set up **Default Limited Use Capabilities [T]** where you can control the usability of the compiled file the first time it is launched, without the need of a license. If you do not apply any of these options, by default, the end user will need to have a license key to use it for the first time. However, if the default limited use capabilities are enabled, e.g., if the number of days is set to 7, when the user opens the executable file for the first time, they will be able to use the file for 7 days without any license keys, and a license key is required to use the file after the first seven days. There are also Advanced Protection [U] capabilities and options that can be set for your compiled Excel file. If you set advanced protection for your compiled files, you can generate the license keys [V] here or in the Project Licensing tab.

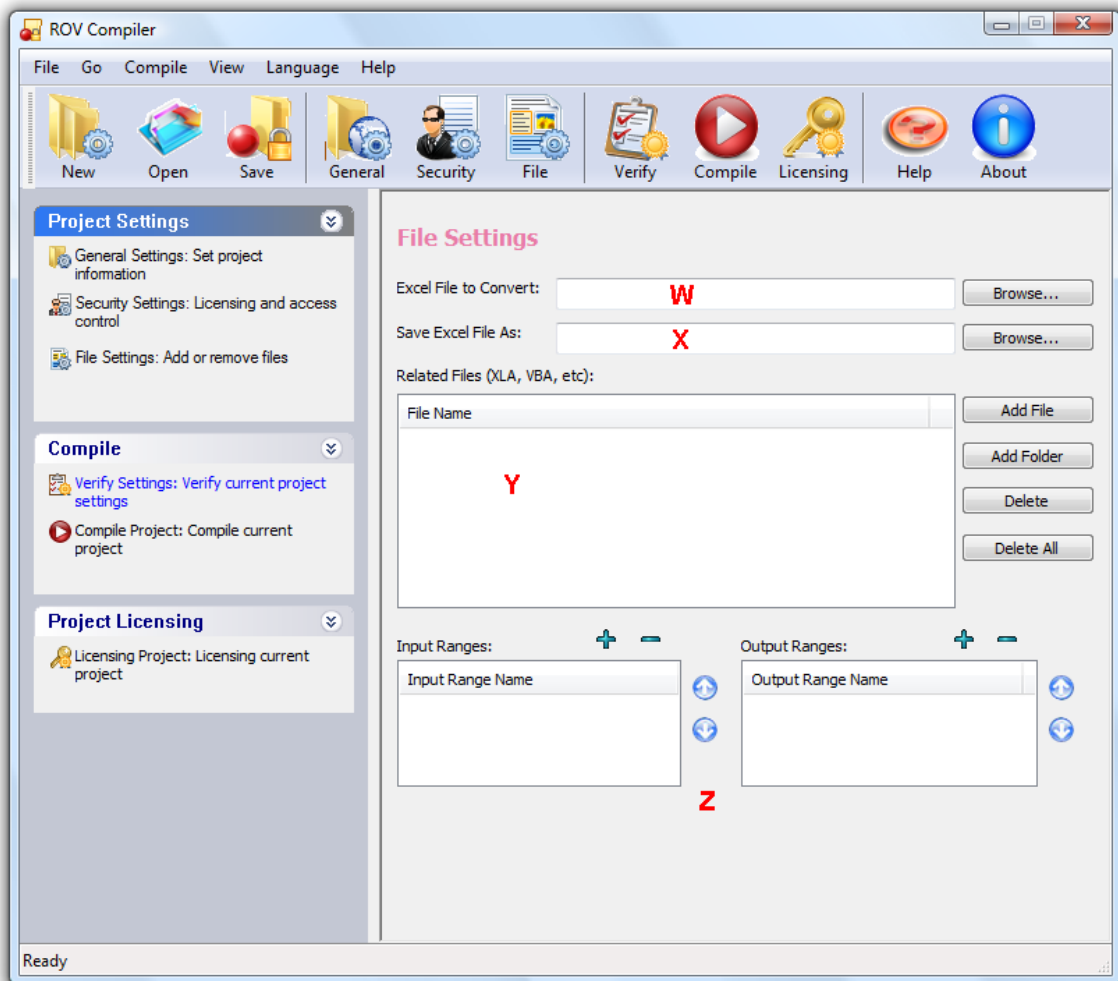
TIP: Simple Password versus Advanced Licensing Protection

Please note that only one protection type is allowed. A simple password is powerful enough to protect unauthorized users access, but once this password is leaked or known, any person with the EXE file armed with the password will have access to your file. Therefore, it is always better to use Advanced Licensing where you can have a significantly higher level of protection for your EXE software and allows you better control over how long a license is valid for and hardware locking capabilities. Finally, the encryption template is something you can enter in yourself or generated by the system. This is the "master key" to licensing and unlocking your compiled software and should not be shared with anyone. Using this encryption template and the user's hardware identification, you can generate license keys that are host locked to a computer. Please see the section on Project Licensing for more details on these additional licensing capabilities.



File Settings

The next step is to set the file settings by selecting the **Excel File to Convert [W]** and identifying the name and location for the compiled EXE or **Save Excel File As [X]**. In addition, if your Excel model uses any other add-ins (e.g., XLA files, VBA files, and so forth), you can add these **Optional Related Files [Y]** here. These add-in files will be compiled together with your Excel file and this is an optional step which will create a support folder. Finally, you can enter in key input and output cells and ranges in the Excel file so that the compiled EXE file can be used to run in console mode or attached to another proprietary software system. That is, the EXE can be run by double clicking on the file and it launches in Excel with ROV Compiler handling all the licensing and protection in the background, and users will have the same environment as in Excel, with multiple worksheets and models, etc. Alternatively, if only a few key outputs are required based on a few key input values, such as in component based modeling, where the input of one model becomes the output of another model, and the model themselves remain the same, whereas the inputs are different each time (think of it as an equation $A+B=C$, but the equation in this case is a very large spreadsheet, with tens to thousands of rows and columns of computations).



TIP: Input and Output Ranges with Console Command Mode

The Input Ranges are like Excel range objects. Each line is one parameter.

- Single Cell: A1
- Continuous Range: A1:C3
- Multiple Cells: A1,D5,F9
- Mixed Range: A1,D5,A2:C6,F1:E2
- Non-active Sheet Range: Sheet2!C1:Sheet2!D2

The Output Ranges are like Excel Cell objects. Each cell is one parameter. It also supports Range settings but A1:C3 means 9 output parameters, not like Input Range. For example:

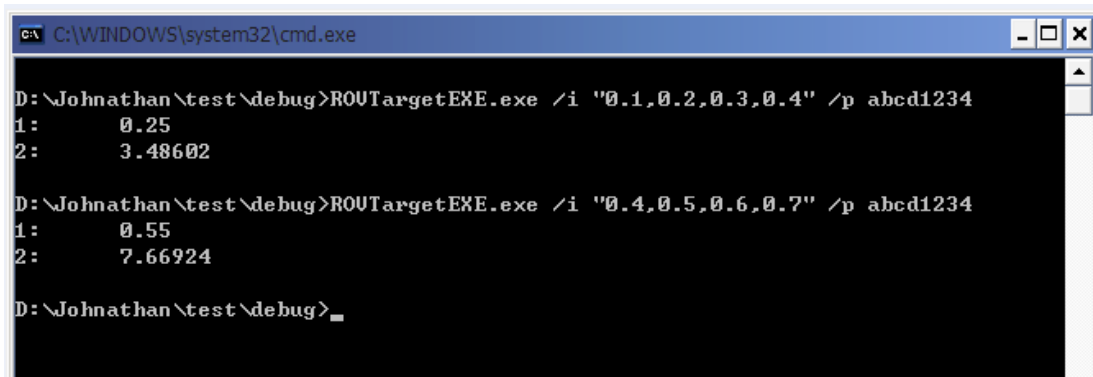
- Single Cell: A1
- Continuous Range: A1:C3 – this is 9 parameters
- Multiple Cells: A1,D5,F9 – this is 3 parameters
- Mixed Range: A1,D5,A2:C6,F1:E2 – this is 21 parameters
- Not-active Sheets Range: Sheet2!C1:Sheet2!D2 – this is 4 parameters

TIP: Running a Compiled EXE in Console Command Mode

In console mode, the following parameters are supported by ROV Compiler:

/input (/i) [value1,[value2],[value3]...	Set input value array
/output (/o) [filename]	Set output file name
/password (/p) [password]	Set password to run the EXE

In Windows, simply click on Start, (in Windows XP, click on RUN, whereas in Windows Vista, click on Start Search box), type in CMD and hit ENTER to obtain the command mode. Below is a sample EXE run using Console command mode.



```
C:\WINDOWS\system32\cmd.exe

D:\Johnathan\test\debug>ROVTargetEXE.exe /i "0.1,0.2,0.3,0.4" /p abcd1234
1:      0.25
2:      3.48602

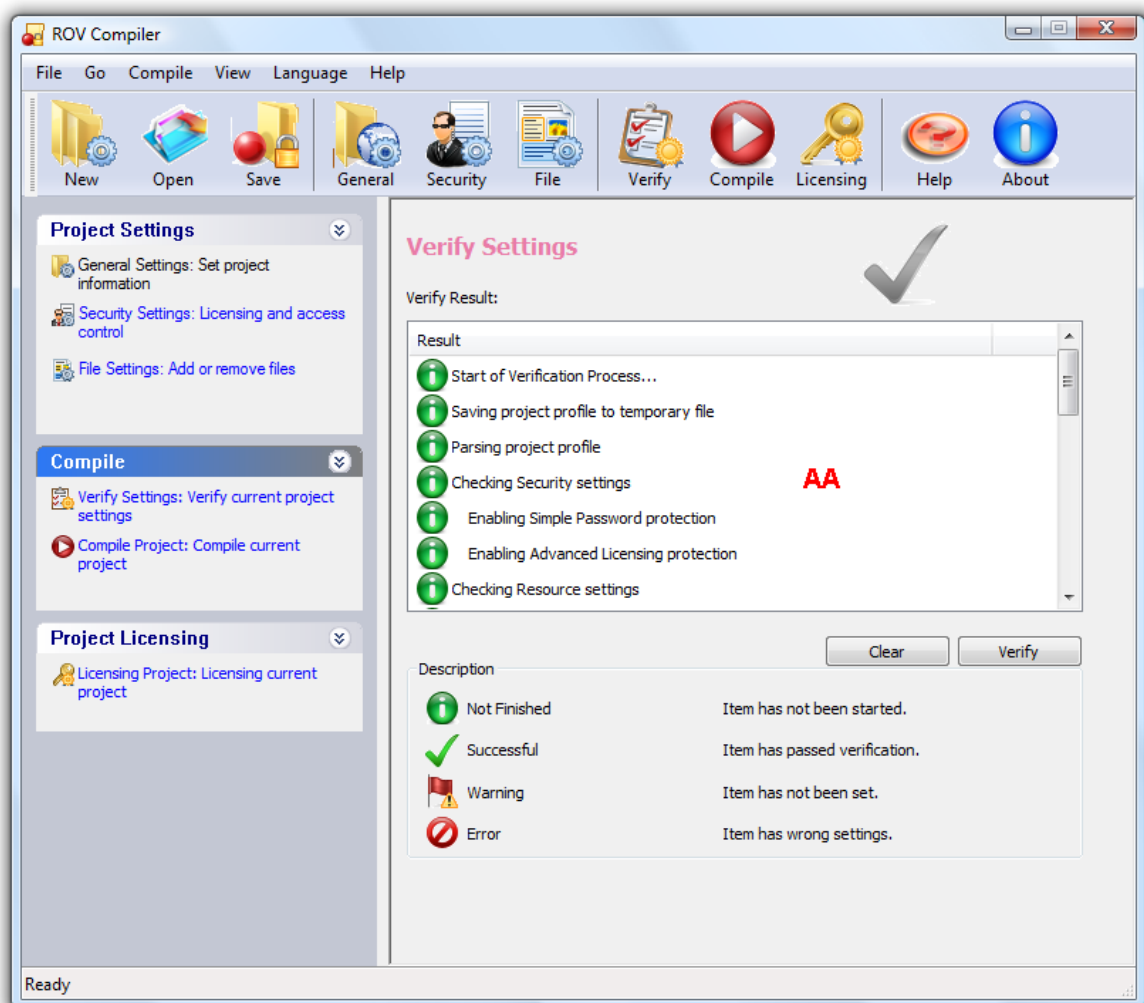
D:\Johnathan\test\debug>ROVTargetEXE.exe /i "0.4,0.5,0.6,0.7" /p abcd1234
1:      0.55
2:      7.66924

D:\Johnathan\test\debug>
```

Verify Settings

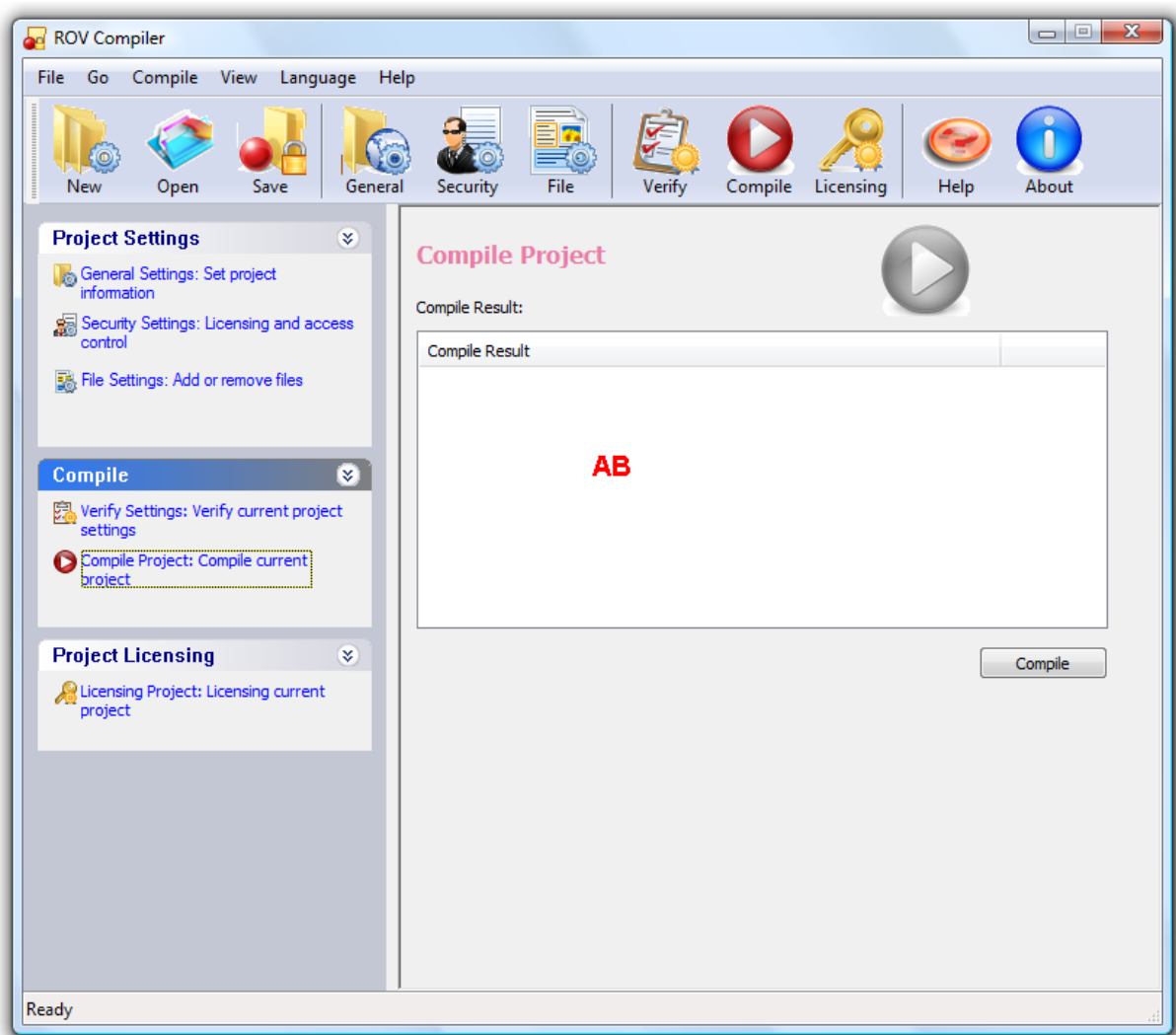
When all the file settings have been set, you can proceed to the **Verify Settings [AA]** tab to test if your settings are correct. Click on the **VERIFY** button and the results will be shown to identify if the file can be compiled correctly.

- **Not Started:** This means there might have been some interruption in the compile and verification process. Please click **CLEAR** and **VERIFY** again to continue.
- **Successful:** This means the setting for that particular item is correct and can be successfully compiled.
- **Warning:** This is only a warning in that a typical but **OPTIONAL** setting or feature was not turned on or used in your project. For example, you can only have either a simple or advanced protection and it provides a warning that one or the other is not set.
- **Error:** There is a severe error in the settings and the file cannot be compiled unless this error is fixed. For example, you may have used the Simple Password option and the password you retyped to verify the initial password did not match and hence the compile process cannot begin until you fix this error.



Compile Project

When the verify settings have passed, you can now **Compile the Project [AB]**. If the compilation process works, you will be notified with a simple message. In contrast, if the project failed to compile for some reason, you will also be notified with a lot more detail on what went wrong.



Licensing Project

Finally, if you set Apply Advanced License in the Security Setting section, you will now need to create licenses for your customers or users (if you chose a Simple Password Protection, you cannot access this page). You can select the type of license to issue, either permanent (no expiration) or temporary licenses (number of uses, days or date expiration) [AC]. Here, you can enter an **Encryption Template [AD]** manually or click on GENERATE to randomly create one for you. This is the same encryption template in the General Settings tab. The encryption template should be long and contain different combinations of letters, numbers and symbols. The license protection for the compiled EXE file will take this encryption template and combine it with the Project ID and Hardware ID to generate a patented license protection. Without this encryption template, there would be no way to regenerate the license key required to unlock the compiled file. You should keep the encryption template private and not share it with anyone else. This template is the master key to generating the license keys. Therefore, remember to always SAVE your project! You should also enter in the end user's computer's **Hardware ID [AE]**. The Hardware ID is generated by obtaining the user computer's hardware information (e.g., serial numbers from the computer's hard drive, mother board, central processing unit, and other hardware) and applying ROV Compiler's proprietary algorithms to generate this unique Hardware ID. No two computers will have the same identification. Using the encryption template and Hardware ID, you can now **Generate Keys [AF]** that will only work on the specific computer. You can click on **COPY [AG]** to copy the license key to memory and paste into an e-mail to send to your client. You can also **Generate Multiple Keys [AH]** at once for multiple computers when you enter in multiple Hardware IDs [AI]. The IDs can be typed in and separated by commas or entered as new lines as illustrated. After **Generating Keys [AJ]**, you can COPY ALL of the keys and their associated IDs to send to your clients.

