

# Summary

**Sink States:**0( $0 \times 10^0$ )

Table 1: Sip4J Analysis Summary

Classes	Methods	States	Unreachable clauses	Unreachable states	Possible concurrent methods	Total. no. of method pairs	No. of concurrent method pairs	Percentage of concurrent methods pairs
JGFMonteCarloBenchSizeA	2	1	0	0	0	3	0	0
JGFMonteCarloBench	7	1	0	0	1	28	1	4
CallAppDemo	4	1	0	0	0	10	0	0
AppDemo	18	1	0	0	6	171	21	12
Universal	11	1	0	0	7	66	28	42
PathId	11	1	0	0	5	66	15	23
RatePath	11	1	0	0	4	66	10	15
ReturnPath	23	1	0	0	9	276	45	16
MonteCarloPath	21	1	0	0	20	231	56	24
ToInitAllTasks	21	1	0	0	10	231	55	24
ToResult	14	1	0	0	7	105	28	27
PriceStock	5	1	0	0	1	15	1	7
ToTask	5	1	0	0	2	15	3	20
DemoException	1	1	0	0	0	1	0	0
JGFInstrumentor	13	1	0	0	12	91	12	13
JGFTimer	9	1	0	0	3	45	6	13
test	4	1	0	0	1	10	1	10
Utilities	5	1	0	0	4	15	8	53
Total Classes=18	185	18	0	0	92	1445	290	20

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# 1 JGFMonteCarloBenchSizeA

Table 2: Method’s Satisfiability(Code Reachabiity Analysis

Method	Satisfiability
JGFMonteCarloBenchSizeA	✓
main	✓

Table 3: State Transition Matrix

	alive
alive	↑

Table 4: Methods Concurrency Matrix

	JGFMonteCarloBenchSizeA	main
JGFMonteCarloBenchSizeA	✗	✗
main	✗	✗

## 2 JGFMonteCarloBench

Table 5: Method's Satisfiability(Code Reachabiity Analysis

Method	Satisfiability
JGFMonteCarloBench	✓
JGFrun	✓
JGFsetsize	✓
JGFinitialise	✓
JGFapplication	✓
JGFvalidate	✓
JGFtidyup	✓

Table 6: State Transition Matrix

	alive
alive	↑

Table 7: Methods Concurrency Matrix

	JGFMonteCarloBench	JGFrun	JGFsetsize	JGFinitialise	JGFapplication	JGFvalidate	JGFtidyup
JGFMonteCarloBench	⌘	⌘	⌘	⌘	⌘	⌘	⌘
JGFrun	⌘	⌘	⌘	⌘	⌘	⌘	⌘
JGFsetsize	⌘	⌘	⌘	⌘	⌘	⌘	⌘
JGFinitialise	⌘	⌘	⌘	⌘	⌘	⌘	⌘
JGFapplication	⌘	⌘	⌘	⌘	⌘	⌘	⌘
JGFvalidate	⌘	⌘	⌘	⌘	⌘		⌘
JGFtidyup	⌘	⌘	⌘	⌘	⌘	⌘	⌘

### 3 CallAppDemo

Table 8: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
CallAppDemo	✓
initialise	✓
presults	✓
runiters	✓

Table 9: State Transition Matrix

	alive
alive	↑

Table 10: Methods Concurrency Matrix

	CallAppDemo	initialise	presults	runiters
CallAppDemo	⌘	⌘	⌘	⌘
initialise	⌘	⌘	⌘	⌘
presults	⌘	⌘	⌘	⌘
runiters	⌘	⌘	⌘	⌘

## 4 AppDemo

Table 11: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
AppDemo	✓
initSerial	✓
initTasks	✓
processSerial	✓
processResults	✓
runSerial	✓
getdataDirname	✓
setdataDirname	✓
getdataFilename	✓
setdataFilename	✓
getnTimeStepsMC	✓
setnTimeStepsMC	✓
getnRunsMC	✓
setnRunsMC	✓
gettasks	✓
settasks	✓
getresults	✓
setresults	✓

Table 12: State Transition Matrix

	alive
alive	↑

Table 13: Methods Concurrency Matrix

	AppDemo	initSerial	initTasks	processSerial	processResults	runSerial	getdataDirname	setdataDirname	getdataFilename	setdataFilename	getnTimeStepsMC	setnTimeStepsMC	getnRunsMC	setnRunsMC	gettasks	settasks	getresults	setresults
AppDemo	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
initSerial	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
initTasks	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
processSerial	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
processResults	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
runSerial	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getdataDirname	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setdataDirname	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getdataFilename	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setdataFilename	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getnTimeStepsMC	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setnTimeStepsMC	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getnRunsMC	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setnRunsMC	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
gettasks	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
settasks	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getresults	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setresults	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

getnRunsMC	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setnRunsMC	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
gettasks	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
settasks	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getresults	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setresults	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

## 5 Universal

Table 14: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
Universal	✓
setprompt	✓
setDEBUG	✓
dbgPrintln	✓
errPrintln	✓
getDEBUG	✓
getUNIVERSALDEBUG	✓
setUNIVERSALDEBUG	✓
getprompt	✓
dbgPrint	✓
errPrint	✓

Table 15: State Transition Matrix

	alive
alive	↑

Table 16: Methods Concurrency Matrix

	Universal	setprompt	setDEBUG	dbgPrintln	errPrintln	getDEBUG	getUNIVERSALDEBUG	setUNIVERSALDEBUG	getprompt	dbgPrint	errPrint
Universal	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
setprompt	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
setDEBUG	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
dbgPrintln	✗	✗	✗					✗			
errPrintln	✗	✗	✗					✗			
getDEBUG	✗	✗	✗					✗			
getUNIVERSALDEBUG	✗	✗	✗					✗			
setUNIVERSALDEBUG	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
getprompt	✗	✗	✗					✗			
dbgPrint	✗	✗	✗					✗			
errPrint	✗	✗	✗					✗			



## 6 PathId

Table 17: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
PathId	✓
dbgDumpFields	✓
copyInstanceVariables	✓
getdTime	✓
getname	✓
getstartDate	✓
getendDate	✓
setname	✓
setstartDate	✓
setendDate	✓
setdTime	✓

Table 18: State Transition Matrix

	alive
alive	↑

Table 19: Methods Concurrency Matrix

	PathId	dbgDumpFields	copyInstanceVariables	getdTime	getname	getstartDate	getendDate	setname	setstartDate	setendDate	setdTime
PathId	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
dbgDumpFields	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
copyInstanceVariables	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getdTime	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getname	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getstartDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getendDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setname	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setstartDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setendDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setdTime	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

## 7 RatePath

Table 20: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
RatePath	✓
getReturnCompounded	✓
getReturnNonCompounded	✓
readRatesFile	✓
getEndPathValue	✓
getPathValue	✓
incpathValue	✓
getpathValue	✓
setpathValue	✓
getpathDate	✓
setpathDate	✓

Table 21: State Transition Matrix

	alive
alive	↑

Table 22: Methods Concurrency Matrix

	RatePath	getReturnCompounded	getReturnNonCompounded	readRatesFile	getEndPathValue	getPathValue	incpathValue	getpathValue	setpathValue	getpathDate	setpathDate
RatePath	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getReturnCompounded	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getReturnNonCompounded	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
readRatesFile	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getEndPathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getPathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
incpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getpathDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setpathDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

## 8 ReturnPath

Table 23: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
ReturnPath	✓
estimatePath	✓
computeMean	✓
computeVariance	✓
computeExpectedReturnRate	✓
computeVolatility	✓
dbgDumpFields	✓
getexpectedReturnRate	✓
getvolatility	✓
getreturnDefinition	✓
getvolatility2	✓
getpathValue	✓
setpathValue	✓
getnPathValue	✓
setnPathValue	✓
setreturnDefinition	✓
setexpectedReturnRate	✓
setvolatility	✓
setvolatility2	✓
getmean	✓
setmean	✓
getvariance	✓
setvariance	✓

Table 24: State Transition Matrix

	alive
alive	↑

Table 25: Methods Concurrency Matrix

	ReturnPath	estimatePath	computeMean	computeVariance	computeExpectedReturnRate	computeVolatility	dbgDumpFields	getexpectedReturnRate	getvolatility	getreturnDefinition	getvolatility2	getpathValue	setpathValue	getnPathValue	setnPathValue	setreturnDefinition	setexpectedReturnRate	setvolatility	setvolatility2	getmean
ReturnPath	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
estimatePath	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
computeMean	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

computeVariance	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
computeExpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
computeVolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
dbgDumpFields	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getexpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getvolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getreturnDefinition	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getvolatility2	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getnPathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setnPathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setreturnDefinition	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setexpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setvolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setvolatility2	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getmean	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setmean	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getvariance	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setvariance	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

## 9 MonteCarloPath

Table 26: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
MonteCarloPath	✓
copyInstanceVariables	✓
setreturnDefinition	✓
setexpectedReturnRate	✓
setvolatility	✓
setnTimeSteps	✓
setpathStartValue	✓
setpathValue	✓
setfluctuations	✓
computeFluctuationsGaussian	✓
computePathValue	✓
getpathValue	✓
getnTimeSteps	✓
getfluctuations	✓
getreturnDefinition	✓
getexpectedReturnRate	✓
getvolatility	✓
getpathStartValue	✓
writeFile	✓
getRatePath	✓
computeFluctuationsGaussianOverload	✓

Table 27: State Transition Matrix

	alive
alive	↑

Table 28: Methods Concurrency Matrix

	MonteCarloPath	copyInstanceVariables	setreturnDefinition	setexpectedReturnRate	setvolatility	setnTimeSteps	setpathStartValue	setpathValue	setfluctuations	computeFluctuationsGaussian	computePathValue	getpathValue	getnTimeSteps	getfluctuations	getreturnDefinition	getexpectedReturnRate	getvolatility	setpathStartValue
MonteCarloPath	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
copyInstanceVariables	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

setreturnDefinition	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setexpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setvolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setnTimeSteps	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setpathStartValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setfluctuations	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
computeFluctuationsGaussian	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
computePathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getnTimeSteps	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getfluctuations	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getreturnDefinition	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getexpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getvolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getpathStartValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
writeFile	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getRatePath	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
computeFluctuationsGaussianOverload	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

## 10 ToInitAllTasks

Table 29: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
ToInitAllTasks	✓
getname	✓
getstartDate	✓
getendDate	✓
getdTime	✓
getreturnDefinition	✓
getexpectedReturnRate	✓
getvolatility	✓
getnTimeSteps	✓
getpathStartValue	✓
getheader	✓
setheader	✓
setname	✓
setstartDate	✓
setendDate	✓
setDTime	✓
setReturnDefinition	✓
setExpectedReturnRate	✓
setVolatility	✓
setnTimeSteps	✓
setpathStartValue	✓

Table 30: State Transition Matrix

	alive
alive	↑

Table 31: Methods Concurrency Matrix

	ToInitAllTasks	getname	getstartDate	getendDate	getdTime	getreturnDefinition	getexpectedReturnRate	getvolatility	getnTimeSteps	getpathStartValue	getheader	setheader	setname	setstartDate	setendDate	setDTime	setReturnDefinition	setExpectedReturnRate	setVolatility	setnTimeSteps	setpathStartValue
ToInitAllTasks	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getname	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getstartDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getendDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getdTime	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getreturnDefinition	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getexpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

getvolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getnTimeSteps	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getpathStartValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getheader	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setheader	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setname	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setstartDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setendDate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setDTime	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setReturnDefinition	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setExpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setVolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setnTimeSteps	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setpathStartValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘



## 11 ToResult

Table 32: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
ToResult	✓
getexpectedReturnRate	✓
getvolatility	✓
toString	✓
getheader	✓
setheader	✓
setexpectedReturnRate	✓
setvolatility	✓
getVolatility2	✓
setvolatility2	✓
getfinalStockPrice	✓
setfinalStockPrice	✓
getpathValue	✓
setpathValue	✓

Table 33: State Transition Matrix

	alive
alive	↑

Table 34: Methods Concurrency Matrix

	ToResult	getexpectedReturnRate	getvolatility	toString	getheader	setheader	setexpectedReturnRate	setvolatility	getVolatility2	setvolatility2	getfinalStockPrice	setfinalStockPrice	getpathValue	setpathValue
ToResult	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getexpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getvolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
toString	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getheader	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setheader	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setexpectedReturnRate	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setvolatility	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getVolatility2	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setvolatility2	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getfinalStockPrice	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setfinalStockPrice	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
getpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
setpathValue	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

## 12 PriceStock

Table 35: Method's Satisfiability(Code Reachabiity Analysis

Method	Satisfiability
PriceStock	✓
setInitAllTasks	✓
setTask	✓
run	✓
getResult	✓

Table 36: State Transition Matrix

	alive
alive	↑

Table 37: Methods Concurrency Matrix

	PriceStock	setInitAllTasks	setTask	run	getResult
PriceStock	⌘	⌘	⌘	⌘	⌘
setInitAllTasks	⌘	⌘	⌘	⌘	⌘
setTask	⌘	⌘	⌘	⌘	⌘
run	⌘	⌘	⌘	⌘	⌘
getResult	⌘	⌘	⌘	⌘	

## 13 ToTask

Table 38: Method's Satisfiability(Code Reachabiity Analysis

Method	Satisfiability
ToTask	✓
getheader	✓
getrandomSeed	✓
setheader	✓
setrandomSeed	✓

Table 39: State Transition Matrix

	alive
alive	↑

Table 40: Methods Concurrency Matrix

	ToTask	getheader	getrandomSeed	setheader	setrandomSeed
ToTask	⌘	⌘	⌘	⌘	⌘
getheader	⌘			⌘	⌘
getrandomSeed	⌘			⌘	⌘
setheader	⌘	⌘	⌘	⌘	⌘
setrandomSeed	⌘	⌘	⌘	⌘	⌘

## 14 DemoException

Table 41: Method's Satisfiability(Code Reachabiity Analysis

Method	Satisfiability
DemoException	✓

Table 42: State Transition Matrix

	alive
alive	↑

## 15 JGFInstrumentor

Table 43: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
JGFInstrumentor	✓
addTimer	✓
startTimer	✓
stopTimer	✓
addOpsToTimer	✓
readTimer	✓
resetTimer	✓
printTimer	✓
printperfTimer	✓
storeData	✓
retrieveData	✓
printHeader	✓
main	✓

Table 44: State Transition Matrix

	alive
alive	↑

Table 45: Methods Concurrency Matrix

	JGFInstrumentor	addTimer	startTimer	stopTimer	addOpsToTimer	readTimer	resetTimer	printTimer	printperfTimer	storeData	retrieveData	printHeader	main
JGFInstrumentor	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
addTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
startTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
stopTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
addOpsToTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
readTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
resetTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
printTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
printperfTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
storeData	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
retrieveData	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
printHeader	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
main	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘

## 16 JGFTimer

Table 46: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
JGFTimer	✓
start	✓
stop	✓
addops	✓
reset	✓
print	✓
perf	✓
printperf	✓
longprint	✓

Table 47: State Transition Matrix

	alive
alive	↑

Table 48: Methods Concurrency Matrix

	JGFTimer	start	stop	addops	reset	print	perf	printperf	longprint
JGFTimer	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
start	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
stop	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
addops	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
reset	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
print	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
perf	⌘	⌘	⌘	⌘	⌘	⌘			
printperf	⌘	⌘	⌘	⌘	⌘	⌘			
longprint	⌘	⌘	⌘	⌘	⌘	⌘			

17 test

Table 49: Method’s Satisfiability(Code Reachabiity Analysis

Method	Satisfiability
test	✓
createObject	✓
readA	✓
main	✓

Table 50: State Transition Matrix

	alive
alive	↑

Table 51: Methods Concurrency Matrix

	test	createObject	readA	main
test	⌘	⌘	⌘	⌘
createObject	⌘	⌘	⌘	⌘
readA	⌘	⌘	⌘	⌘
main	⌘	⌘	⌘	⌘

## 18 Utilities

Table 52: Method's Satisfiability(Code Reachability Analysis)

Method	Satisfiability
Utilities	✓
which	✓
splitString	✓
joinString	✓
joinStringOverloaded	✓

Table 53: State Transition Matrix

	alive
alive	↑

Table 54: Methods Concurrency Matrix

	Utilities	which	splitString	joinString	joinStringOverloaded
Utilities	⌘	⌘	⌘	⌘	⌘
which	⌘	⌘	⌘		
splitString	⌘	⌘			
joinString	⌘				
joinStringOverloaded	⌘				



## 19 Abbreviation

Table 55: Used Abbreviation

Symbol	Meaning
✓	requires clause of the method is satisfiable
✗	requires clause of the method is unsatisfiable
↑	The row-state can be transitioned to the column-state
✕	The row-state cannot be transitioned to the column-state
	The row-method can be possibly executed parallel with the column-method
⋈	The row-method cannot be executed parallel with the column-method

## 20 Annotated version of the input program generated by Sip4J

```
1 package outputs;
2 import edu.cmu.cs.plural.annot.*;
3
4 @ClassStates({@State(name = "alive")})
5 class JGFMonteCarloBenchSizeA {
6   @Perm(ensures="unique(this) in alive")
7   JGFMonteCarloBenchSizeA() { }
8
9   @Perm(requires="unique(this) in alive",
10  ensures="unique(this) in alive")
11   void main(String argv[]) {
12
13 }
14
15 }ENDOFCLASS
16
17 @ClassStates({@State(name = "alive")})
18
19 class JGFMonteCarloBench {
20   @Perm(ensures="unique(this) in alive")
21   JGFMonteCarloBench() { }
22
23   @Perm(requires="unique(this) in alive",
24  ensures="unique(this) in alive")
25   public void JGFrun(int size) {
26
27 }
28   @Perm(requires="share(this) in alive",
29  ensures="share(this) in alive")
30   public void JGFsetsize(int size) {
31
32 }
33   @Perm(requires="unique(this) in alive",
34  ensures="unique(this) in alive")
35   public void JGFinitialise() {
36
37 }
38   @Perm(requires="unique(this) in alive",
39  ensures="unique(this) in alive")
40   public void JGFapplication() {
41
42 }
43   @Perm(requires="pure(this) in alive",
44  ensures="pure(this) in alive")
45   public void JGFvalidate() {
46
47 }
48   @Perm(requires="unique(this) in alive",
49  ensures="unique(this) in alive")
50   public void JGFtidyup() {
51
52 }
53
54 }ENDOFCLASS
55
56 @ClassStates({@State(name = "alive")})
57
58 class CallAppDemo {
59   @Perm(ensures="unique(this) in alive")
60   CallAppDemo() { }
61
62   @Perm(requires="unique(this) in alive",
63  ensures="unique(this) in alive")
64   public void initialise() {
65
66 }
67   @Perm(requires="share(this) in alive",
68  ensures="share(this) in alive")
69   public void presults() {
70
71 }
72   @Perm(requires="unique(this) in alive",
73  ensures="unique(this) in alive")
74   public void runiters() {
75
76 }
77
78 }ENDOFCLASS
```

```

80 @ClassStates({@State(name = "alive")})
82 class AppDemo {
83   @Perm(ensures="unique(this) in alive")
84   AppDemo() { }
86   @Perm(requires="unique(this) in alive",
87     ensures="unique(this) in alive")
88   public void initSerial() {
89   }
90   @Perm(requires="unique(this) in alive",
91     ensures="unique(this) in alive")
92   private void initTasks(int nRunsMC) {
93   }
94   @Perm(requires="share(this) in alive",
95     ensures="share(this) in alive")
96   public void processSerial() {
97   }
98   @Perm(requires="share(this) in alive",
99     ensures="share(this) in alive")
100   private void processResults() {
101   }
102   @Perm(requires="unique(this) in alive",
103     ensures="unique(this) in alive")
104   public void runSerial() {
105   }
106   @Perm(requires="pure(this) in alive",
107     ensures="pure(this) in alive")
108   public String getdataDirname() {
109     return null;
110   }
111   @Perm(requires="full(this) in alive",
112     ensures="full(this) in alive")
113   public void setdataDirname(String dataDirname) {
114   }
115   @Perm(requires="pure(this) in alive",
116     ensures="pure(this) in alive")
117   public String getdataFilename() {
118     return null;
119   }
120   @Perm(requires="full(this) in alive",
121     ensures="full(this) in alive")
122   public void setdataFilename(String dataFilename) {
123   }
124   @Perm(requires="pure(this) in alive",
125     ensures="pure(this) in alive")
126   public int getnTimeStepsMC() {
127     return 0;
128   }
129   @Perm(requires="full(this) in alive",
130     ensures="full(this) in alive")
131   public void setnTimeStepsMC(int nTimeStepsMC) {
132   }
133   @Perm(requires="pure(this) in alive",
134     ensures="pure(this) in alive")
135   public int getnRunsMC() {
136     return 0;
137   }
138   @Perm(requires="full(this) in alive",
139     ensures="full(this) in alive")
140   public void setnRunsMC(int nRunsMC) {
141   }
142   @Perm(requires="pure(this) in alive",
143     ensures="pure(this) in alive")
144   public Vector gettasks() {
145     return null;
146   }

```

```

160 }
161 @Perm(requires="share(this) in alive",
162 ensures="share(this) in alive")
163 public void settasks(Vector tasks) {
164
165 }
166 @Perm(requires="pure(this) in alive",
167 ensures="pure(this) in alive")
168 public Vector getresults() {
169 return null;
170
171 }
172 @Perm(requires="share(this) in alive",
173 ensures="share(this) in alive")
174 public void setresults(Vector results) {
175
176 }
177
178 }ENDOFCLASS
179
180 @ClassStates({@State(name = "alive")})
181
182 class Universal {
183 @Perm(ensures="unique(this) in alive")
184 Universal() { }
185
186 @Perm(requires="full(this) in alive",
187 ensures="full(this) in alive")
188 public void setprompt(String prompt) {
189
190 }
191 @Perm(requires="full(this) in alive",
192 ensures="full(this) in alive")
193 public void setDEBUG(boolean DEBUG) {
194
195 }
196 @Perm(requires="pure(this) in alive",
197 ensures="pure(this) in alive")
198 public void dbgPrintln(String s) {
199
200 }
201 @Perm(requires="pure(this) in alive",
202 ensures="pure(this) in alive")
203 public void errPrintln(String s) {
204
205 }
206 @Perm(requires="pure(this) in alive",
207 ensures="pure(this) in alive")
208 public boolean getDEBUG() {
209 return 0;
210
211 }
212 @Perm(requires="pure(this) in alive",
213 ensures="pure(this) in alive")
214 public boolean getUNIVERSALDEBUG() {
215 return 0;
216
217 }
218 @Perm(requires="full(this) in alive",
219 ensures="full(this) in alive")
220 public void setUNIVERSALDEBUG(boolean UNIVERSAL_DEBUG) {
221
222 }
223 @Perm(requires="pure(this) in alive",
224 ensures="pure(this) in alive")
225 public String getprompt() {
226 return null;
227
228 }
229 @Perm(requires="pure(this) in alive",
230 ensures="pure(this) in alive")
231 public void dbgPrint(String s) {
232
233 }
234 @Perm(requires="pure(this) in alive",
235 ensures="pure(this) in alive")
236 public void errPrint(String s) {
237
238 }
239
240 }ENDOFCLASS

```

```

242 @ClassStates({@State(name = "alive")})
243
244 class PathId {
245     @Perm(ensures="unique(this) in alive")
246     PathId() { }
247
248     @Perm(requires="pure(this) in alive",
249     ensures="pure(this) in alive")
250     public void dbgDumpFields() {
251
252     }
253     @Perm(requires="share(this) in alive",
254     ensures="share(this) in alive")
255     public void copyInstanceVariables(PathId obj) {
256
257     }
258     @Perm(requires="pure(this) in alive",
259     ensures="pure(this) in alive")
260     public double getdTime() {
261         return 0;
262     }
263
264     @Perm(requires="pure(this) in alive",
265     ensures="pure(this) in alive")
266     public String getname() {
267         return null;
268     }
269
270     @Perm(requires="pure(this) in alive",
271     ensures="pure(this) in alive")
272     public int getstartDate() {
273         return 0;
274     }
275
276     @Perm(requires="pure(this) in alive",
277     ensures="pure(this) in alive")
278     public int getendDate() {
279         return 0;
280     }
281
282     @Perm(requires="share(this) in alive",
283     ensures="share(this) in alive")
284     public void setname(String name) {
285
286     }
287     @Perm(requires="share(this) in alive",
288     ensures="share(this) in alive")
289     public void setstartDate(int startDate) {
290
291     }
292     @Perm(requires="share(this) in alive",
293     ensures="share(this) in alive")
294     public void setendDate(int endDate) {
295
296     }
297     @Perm(requires="share(this) in alive",
298     ensures="share(this) in alive")
299     public void setdTime(double dTime) {
300
301     }
302 }
303 }ENDOFCLASS
304
305 @ClassStates({@State(name = "alive")})
306
307 class RatePath {
308     @Perm(ensures="unique(this) in alive")
309     RatePath() { }
310
311     @Perm(requires="share(this) in alive",
312     ensures="share(this) in alive")
313     public ReturnPath getReturnCompounded() {
314         return null;
315     }
316
317     @Perm(requires="share(this) in alive",
318     ensures="share(this) in alive")
319     public ReturnPath getReturnNonCompounded() {
320         return null;

```

```

322 }
323 @Perm(requires="unique(this) in alive",
324 ensures="unique(this) in alive")
325 private void readRatesFile(String dirName, String filename) {
326
327 }
328 @Perm(requires="pure(this) in alive",
329 ensures="pure(this) in alive")
330 public double getEndPathValue() {
331     return 0;
332 }
333
334 @Perm(requires="pure(this) in alive",
335 ensures="pure(this) in alive")
336 public double getPathValue(int index) {
337     return 0;
338 }
339
340 @Perm(requires="share(this) in alive",
341 ensures="share(this) in alive")
342 public void incpathValue(double[] operandPath) {
343
344 }
345 @Perm(requires="pure(this) in alive",
346 ensures="pure(this) in alive")
347 public double[] getpathValue() {
348     return null;
349 }
350
351 @Perm(requires="share(this) in alive",
352 ensures="share(this) in alive")
353 public void setpathValue(double[] pathValue) {
354
355 }
356 @Perm(requires="pure(this) in alive",
357 ensures="pure(this) in alive")
358 public int[] getpathDate() {
359     return null;
360 }
361
362 @Perm(requires="share(this) in alive",
363 ensures="share(this) in alive")
364 public void setpathDate(int[] pathDate) {
365
366 }
367
368 }ENDOFCLASS
369
370 @ClassStates({@State(name = "alive")})
371
372 class ReturnPath {
373     @Perm(ensures="unique(this) in alive")
374     ReturnPath() { }
375
376     @Perm(requires="share(this) in alive",
377     ensures="share(this) in alive")
378     public void estimatePath() {
379
380     }
381     @Perm(requires="share(this) in alive",
382     ensures="share(this) in alive")
383     public void computeMean() {
384
385     }
386     @Perm(requires="share(this) in alive",
387     ensures="share(this) in alive")
388     public void computeVariance() {
389
390     }
391     @Perm(requires="share(this) in alive",
392     ensures="share(this) in alive")
393     public void computeExpectedReturnRate() {
394
395     }
396     @Perm(requires="share(this) in alive",
397     ensures="share(this) in alive")
398     public void computeVolatility() {
399
400     }
401     @Perm(requires="pure(this) in alive",
402     ensures="pure(this) in alive")

```

```

403 public void dbgDumpFields() {
404 }
405 @Perm(requires="pure(this) in alive",
406 ensures="pure(this) in alive")
407 public double getexpectedReturnRate() {
408 return 0;
409 }
410 @Perm(requires="pure(this) in alive",
411 ensures="pure(this) in alive")
412 public double getvolatility() {
413 return 0;
414 }
415 @Perm(requires="pure(this) in alive",
416 ensures="pure(this) in alive")
417 public int getreturnDefinition() {
418 return 0;
419 }
420 @Perm(requires="pure(this) in alive",
421 ensures="pure(this) in alive")
422 public double getvolatility2() {
423 return 0;
424 }
425 @Perm(requires="pure(this) in alive",
426 ensures="pure(this) in alive")
427 public double[] getpathValue() {
428 return null;
429 }
430 @Perm(requires="full(this) in alive",
431 ensures="full(this) in alive")
432 public void setpathValue(double[] pathValue) {
433 }
434 @Perm(requires="pure(this) in alive",
435 ensures="pure(this) in alive")
436 public int getnPathValue() {
437 return 0;
438 }
439 @Perm(requires="full(this) in alive",
440 ensures="full(this) in alive")
441 public void setnPathValue(int nPathValue) {
442 }
443 @Perm(requires="full(this) in alive",
444 ensures="full(this) in alive")
445 public void setreturnDefinition(int returnDefinition) {
446 }
447 @Perm(requires="share(this) in alive",
448 ensures="share(this) in alive")
449 public void setexpectedReturnRate(double expectedReturnRate) {
450 }
451 @Perm(requires="share(this) in alive",
452 ensures="share(this) in alive")
453 public void setvolatility(double volatility) {
454 }
455 @Perm(requires="share(this) in alive",
456 ensures="share(this) in alive")
457 public void setvolatility2(double volatility2) {
458 }
459 @Perm(requires="pure(this) in alive",
460 ensures="pure(this) in alive")
461 public double getmean() {
462 return 0;
463 }
464 @Perm(requires="share(this) in alive",
465 ensures="share(this) in alive")
466 public void setmean(double mean) {
467 }
468 @Perm(requires="pure(this) in alive",

```

```

484 ensures="pure(this) in alive")
485 public double getvariance() {
486     return 0;
487 }
488 }
489 @Perm(requires="share(this) in alive",
490 ensures="share(this) in alive")
491 public void setvariance(double variance) {
492 }
493 }
494 }ENDOFCLASS
495
496 @ClassStates({@State(name = "alive")})
497
498 class MonteCarloPath {
499 @Perm(ensures="unique(this) in alive")
500 MonteCarloPath() { }
501
502 @Perm(requires="share(this) in alive",
503 ensures="share(this) in alive")
504 private void copyInstanceVariables(ReturnPath obj) {
505 }
506 }
507 @Perm(requires="share(this) in alive",
508 ensures="share(this) in alive")
509 public void setreturnDefinition(int returnDefinition) {
510 }
511 }
512 @Perm(requires="share(this) in alive",
513 ensures="share(this) in alive")
514 public void setexpectedReturnRate(double expectedReturnRate) {
515 }
516 }
517 @Perm(requires="share(this) in alive",
518 ensures="share(this) in alive")
519 public void setvolatility(double volatility) {
520 }
521 }
522 @Perm(requires="share(this) in alive",
523 ensures="share(this) in alive")
524 public void setnTimeSteps(int nTimeSteps) {
525 }
526 }
527 @Perm(requires="share(this) in alive",
528 ensures="share(this) in alive")
529 public void setpathStartValue(double pathStartValue) {
530 }
531 }
532 @Perm(requires="share(this) in alive",
533 ensures="share(this) in alive")
534 public void setpathValue(double[] pathValue) {
535 }
536 }
537 @Perm(requires="share(this) in alive",
538 ensures="share(this) in alive")
539 public void setfluctuations(double[] fluctuations) {
540 }
541 }
542 @Perm(requires="share(this) in alive",
543 ensures="share(this) in alive")
544 public void computeFluctuationsGaussian(long randomSeed) {
545 }
546 }
547 @Perm(requires="share(this) in alive",
548 ensures="share(this) in alive")
549 public void computePathValue(double startValue) {
550 }
551 }
552 @Perm(requires="pure(this) in alive",
553 ensures="pure(this) in alive")
554 public double[] getpathValue() {
555     return null;
556 }
557 }
558 @Perm(requires="pure(this) in alive",
559 ensures="pure(this) in alive")
560 public int getnTimeSteps() {
561     return 0;
562 }
563 }

```



```

565 @Perm(requires="pure(this) in alive",
566 ensures="pure(this) in alive")
567 public double[] getfluctuations() {
568     return null;
569 }
570 }
571 @Perm(requires="pure(this) in alive",
572 ensures="pure(this) in alive")
573 public int getreturnDefinition() {
574     return 0;
575 }
576 }
577 @Perm(requires="pure(this) in alive",
578 ensures="pure(this) in alive")
579 public double getexpectedReturnRate() {
580     return 0;
581 }
582 }
583 @Perm(requires="pure(this) in alive",
584 ensures="pure(this) in alive")
585 public double getvolatility() {
586     return 0;
587 }
588 }
589 @Perm(requires="pure(this) in alive",
590 ensures="pure(this) in alive")
591 public double getpathStartValue() {
592     return 0;
593 }
594 }
595 @Perm(requires="pure(this) in alive",
596 ensures="pure(this) in alive")
597 public void writeFile(String dirName, String filename) {
598 }
599 }
600 }
601 public RatePath getRatePath() {
602     return null;
603 }
604 }
605 @Perm(requires="share(this) in alive",
606 ensures="share(this) in alive")
607 public void computeFluctuationsGaussianOverload() {
608 }
609 }
610 }
611 }ENDOFCLASS
612 }
613 @ClassStates({@State(name = "alive")})
614 }
615 class ToInitAllTasks {
616 @Perm(ensures="unique(this) in alive")
617 ToInitAllTasks() { }
618 }
619 }
620 @Perm(requires="pure(this) in alive",
621 ensures="pure(this) in alive")
622 public String getname() {
623     return null;
624 }
625 }
626 @Perm(requires="pure(this) in alive",
627 ensures="pure(this) in alive")
628 public int getstartDate() {
629     return 0;
630 }
631 }
632 @Perm(requires="pure(this) in alive",
633 ensures="pure(this) in alive")
634 public int getendDate() {
635     return 0;
636 }
637 }
638 @Perm(requires="pure(this) in alive",
639 ensures="pure(this) in alive")
640 public double getdTime() {
641     return 0;
642 }
643 }
644 @Perm(requires="pure(this) in alive",
645 ensures="pure(this) in alive")
646 public int getreturnDefinition() {

```

```

646     return 0;
647 }
648 @Perm(requires="pure(this) in alive",
649 ensures="pure(this) in alive")
650 public double getexpectedReturnRate() {
651     return 0;
652 }
653 @Perm(requires="pure(this) in alive",
654 ensures="pure(this) in alive")
655 public double getvolatility() {
656     return 0;
657 }
658 @Perm(requires="pure(this) in alive",
659 ensures="pure(this) in alive")
660 public int getnTimeSteps() {
661     return 0;
662 }
663 @Perm(requires="pure(this) in alive",
664 ensures="pure(this) in alive")
665 public double getpathStartValue() {
666     return 0;
667 }
668 @Perm(requires="pure(this) in alive",
669 ensures="pure(this) in alive")
670 public String getheader() {
671     return null;
672 }
673 @Perm(requires="full(this) in alive",
674 ensures="full(this) in alive")
675 public void setheader(String header) {
676 }
677 @Perm(requires="full(this) in alive",
678 ensures="full(this) in alive")
679 public void setname(String name) {
680 }
681 @Perm(requires="full(this) in alive",
682 ensures="full(this) in alive")
683 public void setstartDate(int startDate) {
684 }
685 @Perm(requires="full(this) in alive",
686 ensures="full(this) in alive")
687 public void setendDate(int endDate) {
688 }
689 @Perm(requires="full(this) in alive",
690 ensures="full(this) in alive")
691 public void setDTime(double dTime) {
692 }
693 @Perm(requires="full(this) in alive",
694 ensures="full(this) in alive")
695 public void setReturnDefinition(int returnDefinition) {
696 }
697 @Perm(requires="full(this) in alive",
698 ensures="full(this) in alive")
699 public void setExpectedReturnRate(double expectedReturnRate) {
700 }
701 @Perm(requires="full(this) in alive",
702 ensures="full(this) in alive")
703 public void setVolatility(double volatility) {
704 }
705 @Perm(requires="full(this) in alive",
706 ensures="full(this) in alive")
707 public void setnTimeSteps(int nTimeSteps) {
708 }
709 @Perm(requires="full(this) in alive",
710 ensures="full(this) in alive")
711 public void setpathStartValue(double pathStartValue) {

```

```

728 }
730 }ENDOFCLASS
732 @ClassStates({@State(name = "alive")})
734 class ToResult {
735   @Perm(ensures="unique(this) in alive")
736   ToResult() { }
738   @Perm(requires="pure(this) in alive",
739     ensures="pure(this) in alive")
740   public double getexpectedReturnRate() {
741     return 0;
743   }
744   @Perm(requires="pure(this) in alive",
745     ensures="pure(this) in alive")
746   public double getvolatility() {
747     return 0;
749   }
750   @Perm(requires="pure(this) in alive",
751     ensures="pure(this) in alive")
752   public String toString() {
753     return null;
755   }
756   @Perm(requires="pure(this) in alive",
757     ensures="pure(this) in alive")
758   public String getheader() {
759     return null;
761   }
762   @Perm(requires="full(this) in alive",
763     ensures="full(this) in alive")
764   public void setheader(String header) {
766   }
767   @Perm(requires="full(this) in alive",
768     ensures="full(this) in alive")
769   public void setexpectedReturnRate(double expectedReturnRate) {
771   }
772   @Perm(requires="full(this) in alive",
773     ensures="full(this) in alive")
774   public void setvolatility(double volatility) {
776   }
777   @Perm(requires="pure(this) in alive",
778     ensures="pure(this) in alive")
779   public double getVolatility2() {
780     return 0;
782   }
783   @Perm(requires="full(this) in alive",
784     ensures="full(this) in alive")
785   public void setvolatility2(double volatility2) {
787   }
788   @Perm(requires="pure(this) in alive",
789     ensures="pure(this) in alive")
790   public double getfinalStockPrice() {
791     return 0;
793   }
794   @Perm(requires="full(this) in alive",
795     ensures="full(this) in alive")
796   public void setfinalStockPrice(double finalStockPrice) {
798   }
799   @Perm(requires="pure(this) in alive",
800     ensures="pure(this) in alive")
801   public double[] getpathValue() {
802     return null;
804   }
805   @Perm(requires="full(this) in alive",
806     ensures="full(this) in alive")
807   public void setpathValue(double[] pathValue) {

```

```

809 }
811 }ENDOFCLASS
813 @ClassStates({@State(name = "alive")})
815 class PriceStock {
816   @Perm(ensures="unique(this) in alive")
817   PriceStock() { }
819   @Perm(requires="share(this) in alive",
820     ensures="share(this) in alive")
821   public void setInitAllTasks(Object obj) {
823   }
824   @Perm(requires="share(this) in alive",
825     ensures="share(this) in alive")
826   public void setTask(Object obj) {
828   }
829   @Perm(requires="share(this) in alive",
830     ensures="share(this) in alive")
831   public void run() {
833   }
834   @Perm(requires="pure(this) in alive",
835     ensures="pure(this) in alive")
836   public Object getResult() {
837     return null;
839   }
841 }ENDOFCLASS
843 @ClassStates({@State(name = "alive")})
845 class ToTask {
846   @Perm(ensures="unique(this) in alive")
847   ToTask() { }
849   @Perm(requires="pure(this) in alive",
850     ensures="pure(this) in alive")
851   public String getheader() {
852     return null;
854   }
855   @Perm(requires="pure(this) in alive",
856     ensures="pure(this) in alive")
857   public long getrandomSeed() {
858     return 0;
860   }
861   @Perm(requires="full(this) in alive",
862     ensures="full(this) in alive")
863   public void setheader(String header) {
865   }
866   @Perm(requires="full(this) in alive",
867     ensures="full(this) in alive")
868   public void setrandomSeed(long randomSeed) {
870   }
872 }ENDOFCLASS
874 @ClassStates({@State(name = "alive")})
876 class DemoException {
877   @Perm(ensures="unique(this) in alive")
878   DemoException() { }
881 }ENDOFCLASS
883 @ClassStates({@State(name = "alive")})
885 class JGFInstrumentor {
886   @Perm(ensures="unique(this) in alive")
887   JGFInstrumentor() { }

```

```

889 @Perm(requires="share(this) in alive",
890 ensures="share(this) in alive")
891 void addTimer(String name) {
892
893 }
894 @Perm(requires="share(this) in alive",
895 ensures="share(this) in alive")
896 void startTimer(String name) {
897
898 }
899 @Perm(requires="share(this) in alive",
900 ensures="share(this) in alive")
901 void stopTimer(String name) {
902
903 }
904 @Perm(requires="share(this) in alive",
905 ensures="share(this) in alive")
906 void addOpsToTimer(String name, double count) {
907
908 }
909 @Perm(requires="share(this) in alive",
910 ensures="share(this) in alive")
911 double readTimer(String name) {
912     return 0;
913 }
914
915 @Perm(requires="share(this) in alive",
916 ensures="share(this) in alive")
917 void resetTimer(String name) {
918
919 }
920 @Perm(requires="share(this) in alive",
921 ensures="share(this) in alive")
922 void printTimer(String name) {
923
924 }
925 @Perm(requires="share(this) in alive",
926 ensures="share(this) in alive")
927 void printperfTimer(String name) {
928
929 }
930 @Perm(requires="share(this) in alive",
931 ensures="share(this) in alive")
932 void storeData(String name, Object obj) {
933
934 }
935 @Perm(requires="share(this) in alive",
936 ensures="share(this) in alive")
937 void retrieveData(String name, Object obj) {
938
939 }
940
941 void printHeader(int section, int size) {
942
943 }
944 @Perm(requires="unique(this) in alive",
945 ensures="unique(this) in alive")
946 void main(String argv[]) {
947
948 }
949
950 }ENDOFCLASS
951
952 @ClassStates({@State(name = "alive")})
953
954 class JGFTimer {
955     @Perm(ensures="unique(this) in alive")
956     JGFTimer() { }
957
958     @Perm(requires="share(this) in alive",
959     ensures="share(this) in alive")
960     public void start() {
961
962     }
963     @Perm(requires="share(this) in alive",
964     ensures="share(this) in alive")
965     public void stop() {
966
967     }
968     @Perm(requires="share(this) in alive",
969     ensures="share(this) in alive")

```

```

970     public void addops(double count) {
971     }
972 }
973 @Perm(requires="share(this) in alive",
974 ensures="share(this) in alive")
975 public void reset() {
976 }
977 @Perm(requires="share(this) in alive",
978 ensures="share(this) in alive")
979 public void print() {
980 }
981 @Perm(requires="pure(this) in alive",
982 ensures="pure(this) in alive")
983 public double perf() {
984     return 0;
985 }
986 @Perm(requires="pure(this) in alive",
987 ensures="pure(this) in alive")
988 public void printperf() {
989 }
990 @Perm(requires="pure(this) in alive",
991 ensures="pure(this) in alive")
992 public void longprint() {
993 }
994 @Perm(requires="pure(this) in alive",
995 ensures="pure(this) in alive")
996 public void longprint() {
997 }
998 }
999 }ENDOFCLASS
1000 @ClassStates({@State(name = "alive")})
1001
1002 class test {
1003     @Perm(ensures="unique(this) in alive")
1004     test() { }
1005
1006     @Perm(requires="unique(this) in alive",
1007     ensures="unique(this) in alive")
1008     public void createObject() {
1009
1010     }
1011     @Perm(requires="pure(this) in alive",
1012     ensures="pure(this) in alive")
1013     public void readA() {
1014
1015     }
1016     @Perm(requires="unique(this) in alive",
1017     ensures="unique(this) in alive")
1018     void main(String[] arg) {
1019
1020     }
1021 }
1022 }ENDOFCLASS
1023 @ClassStates({@State(name = "alive")})
1024
1025 class Utilities {
1026     @Perm(ensures="unique(this) in alive")
1027     Utilities() { }
1028
1029     @Perm(requires="unique(this) in alive",
1030     ensures="unique(this) in alive")
1031     String which(String executable, String pathEnv) {
1032         return null;
1033     }
1034
1035     @Perm(requires="immutable(this) in alive",
1036     ensures="immutable(this) in alive")
1037     String[] splitString(String splitChar, String arg) {
1038         return null;
1039     }
1040
1041     String joinString(String joinChar, String stringArray[]) {
1042         return null;
1043     }
1044
1045     String joinStringOverloaded(String joinChar, String stringArray[], int index) {

```

```
1051     return null;
1053 }
1055 }ENDOFCLASS
```