Fibonacci Code Verification

Given the Fibonacci sequence, $f_0 = 0, f_1 = 1$, and $f_i = f_{i-1} + f_{i-2}$, prove that the program segment

```
fibm2 := 0
fibm1 := 1
i := 2
while i ≤n do
    fib := fibm1+fibm2
    fibm2 = fibm1
    fibm1 = fib
    i := i+1
end
```

is partially correct with respect to precondition "$n \geq 2$" and postcondition "$fib = f_n$".

$\underline{\hspace{4cm}} n \geq 2$

fibm2 := 0 $\underline{\hspace{2cm}} n \geq 2 \wedge fibm2 = 0$

fibm1 := 1 $\underline{\hspace{2cm}} n \geq 2 \wedge fibm2 = 0 \wedge fibm1 = 1$

i := 2 $\underline{\hspace{2cm}} n \geq 2 \wedge fibm2 = 0 \wedge fibm1 = 1 \wedge i = 2$

$\underline{\hspace{3cm}} i \leq n+1 \wedge fibm2 = f_{i-2} \wedge fibm1 = f_{i-1} \wedge (i \geq 3 \Rightarrow fib = f_{i-1}) \wedge n \geq 2$

while i ≤n **do** $\underline{\hspace{2cm}} i \leq n \wedge fibm2 = f_{i-2} \wedge fibm1 = f_{i-1} \wedge (i \geq 3 \Rightarrow fib = f_{i-1}) \wedge n \geq 2$

     fib := fibm1+fibm2 $\underline{\hspace{1cm}} i \leq n \wedge fibm2 = f_{i-2} \wedge fibm1 = f_{i-1} \wedge fib = f_i \wedge n \geq 2$

     fibm2 = fibm1 $\underline{\hspace{1.5cm}} i \leq n \wedge fibm2 = f_{i-1} \wedge fibm1 = f_{i-1} \wedge fib = f_i \wedge n \geq 2$

     fibm1 = fib $\underline{\hspace{2cm}} i \leq n \wedge fibm2 = f_{i-1} \wedge fibm1 = f_i \wedge fib = f_i \wedge n \geq 2$

     i := i+1 $\underline{\hspace{2cm}} i \leq n+1 \wedge fibm2 = f_{i-2} \wedge fibm1 = f_{i-1} \wedge fib = f_{i-1} \wedge n \geq 2$

end $\underline{\hspace{2cm}} i \leq n+1 \wedge fibm2 = f_{i-2} \wedge fibm1 = f_{i-1} \wedge (i \geq 3 \Rightarrow fib = f_{i-1}) \wedge n \geq 2$

$\underline{\hspace{1.5cm}} i > n \wedge i \leq n+1 \wedge fibm2 = f_{i-2} \wedge fibm1 = f_{i-1} \wedge (i \geq 3 \Rightarrow fib = f_{i-1}) \wedge n \geq 2$

$\underline{\hspace{1.5cm}} i = n+1 \wedge (i \geq 3 \Rightarrow fib = f_{i-1}) \wedge n \geq 2$

$\underline{\hspace{1cm}} fib = f_n$