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GENERALIZED CONDITIONAL YEH-WIENER INTEGRALS AND A WIENER INTEGRAL EQUATION

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ABSTRACT. Let $Q = [0,S] \times [0,T]$ and let $h \in L_2(Q)$. In this paper we evaluate conditional Yeh-Wiener integrals of the type

$$E\bigg[\exp\bigg\{\int_0^t\int_0^s \phi(\sigma,\tau, \int_0^\tau\int_0^\sigma h(u,v)\,dx(u,v))\,d\sigma\,d\tau\bigg\} \mid \int_0^t\int_0^s h(u,v)\,dx(u,v)=\xi\bigg].$$

The method we use to evaluate these conditional integrals is first to define a sample path-valued conditional Yeh-Wiener integral and show that it satisfies a Wiener integral equation. We next obtain a series solution to this Wiener integral equation which we then use to evaluate the above conditional Yeh-Wiener integral.

1. Introduction. For $Q = [0,S] \times [0,T]$, let $C(Q)$ denote Yeh-Wiener space, i.e., the space of all real-valued continuous functions $x(s,t)$ on Q such that $x(0,t) = x(s,0) = 0$ for every (s,t) in Q. Yeh [**10**] defined a Gaussian measure m_y on $C(Q)$ (later modified in [**11**]) such that as a stochastic process $\{x(s,t),(s,t) \in Q\}$ has mean $E[x(s,t)] \equiv \int_{C(Q)} x(s,t)m_y(dx) = 0$ and covariance $E[x(s,t)x(u,v)] = \min\{s,u\}\min\{t,v\}$. Let $C_w \equiv C[0,T]$ denote the standard Wiener space on $[0,T]$ with Wiener measure m_w. In [**12**], Yeh introduced the concept of the conditional Wiener integral of F given $X, E[F \mid X]$, and for the case $X(x) = x(T)$ obtained some very useful results including a Kac-Feynman integral equation.

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